

NOTIFICATION OF ADDENDUM

ADDENDUM NO. 1

DATED 10/23/2014

Control	0521-06-135
Project	STP 2015(290)HES
Highway	IH 410
County	BEXAR

Ladies/Gentlemen:

Attached please find an addendum on the above captioned project. Included in the attachment is an addendum notification which details the changes and the respective proposal pages which were added and/or changed.

Except for new bid insert pages, it is unnecessary to return any of the pages attached.

Bid insert pages must be returned with the bid proposal submitted to the Department, unless your firm is submitting a bid using a computer print out. The computer print out must be changed to reflect the new bid item information.

Contractors and material suppliers, etc. who have previously been furnished informational proposals are not being furnished a copy of the addendum. If you have a subcontractor on the above project, please advise them of this addendum. Acknowledgment of this addendum is not requested if your company has been issued a proposal stamped "This Proposal Issued for Informational Purposes."

You are required to acknowledge receipt of this addendum on the Addendum Acknowledgement form contained in your bid proposal by placing a mark in the box next to the respective addendum.

Failure to Acknowledge receipt of this addendum in your bid proposal will result in your bid not being read.

SUBJECT: PLANS AND PROPOSAL ADDENDUMS

PROJECT: STP 2015(290)HES

CONTROL: 0521-06-135

COUNTY: BEXAR

LETTING: 11/05/2014

REFERENCE NO: 1021

PROPOSAL ADDENDUMS

X PROPOSAL COVER

X BID INSERTS (SH. NO.: 1-4 thru 4-4

X GENERAL NOTES (SH. NO.: Sheet A thru Sheet I

X SPEC LIST (SH. NO.: Sheet 2 of 3

- SPECIAL PROVISIONS:

ADDED:

DELETED:

X SPECIAL SPECIFICATIONS:

ADDED: 3142, 3283

DELETED:

X OTHER: Sheets revised: 2,3,6 thru 6E,7,8,9,11,12A,14,&38

Added Sheets: 5A,7A & 37A

DESCRIPTION OF ABOVE CHANGES

(INCLUDING PLANS SHEET CHANGES)

Proposal

Changed the number of working days from 55 to 67 days.

Bid Tabs

Revised Quantities for items 454-2007, 454-2008, 502-2001, 662-2004
662-2005, 662-2012, 662-2032, 666-2036, 672-2017, 8251-2006,
8251-2009, 8251-2018.

Added Alternate 2 - Items: 3142-2003, 3142-2007, 3142-2009.

Added Alternate 2A - Items: 316-2778, 316-2780, 3283-2008, 3283-2010.

Added Altenate 2B - Items: 3233-2001, 3283-2008, 3283-2010.

General Notes: Added UTBMWC-Base Bid 2 to Basis of Estimate

Added TSM TOM - ALternate to UTBMWC - ALternate Bid 2 (A&B).

Added Suface Treatment Data - For use with TSM TOM.

DESCRIPTION OF ABOVE CHANGES

(INCLUDING PLANS SHEET CHANGES)

(CONTINUED)

Added last note under Item 3142.

Plans

Sheet 2 Index of Sheets: Added Shts. 5A, 6E, 12A, 37A

Sheet 3 Project Layout: Revised and added limits of incidental interchange work.

Sheet 5A, IH37 Interchange Connector Typical Sections: Added to include incidental interchange work.

Sheet 6, 6a-6e, added note 542 and 662.

Sheet 7, 7A, Revised quantities as shown under bid tabs.

Sheet 8, Grading and SW3P Summary: Added incidental interchange work quantities.

Sheet 9, Pavement Marking Summary: Added incidental interchange work quantities.

Sheet 11, Traffic Control Narrative: Revised phasing to include incidental interchange work.

Sheet 12A, IH37 Interchange Connector Detour Layout: Added to include detours for incidental interchange work.

Sheet 14, Schedule of Barricades and Advance Warning Device: Revised to include incidental interchange work.

Sheet 37A, IH37 Interchange Connector Details: Added to show incidental interchange work.

Sheet 38, Plan Sheet 1 of 19: Added limits and notes for incidental interchange work.

Control	0521-06-135
Project	STP 2015(290)HES
Highway	IH 410
County	BEXAR

PROPOSAL TO THE TEXAS TRANSPORTATION COMMISSION

2004 SPECIFICATIONS

WORK CONSISTING OF RESURFACING, TEXTURIZED SHOULDERS BEXAR COUNTY, TEXAS

The quantities in the proposal are approximate. The quantities of work and materials may be increased or decreased as considered necessary to complete the work as planned and contemplated.

This project is to be completed in 67 working days and will be accepted when fully completed and finished to the satisfaction of the Executive Director or designee.

Provide a proposal guaranty in the form of a Cashier's Check, Teller's Check (including an Official Check) or Bank Money Order on a State or National Bank or Savings and Loan Association, or State or Federally chartered Credit Union made payable to the Texas Transportation Commission in the following amount:

ONE HUNDRED THOUSAND (Dollars) (\$100,000)

A bid bond may be used as the required proposal guaranty. The bond form may be detached from the proposal for completion. The proposal may not be disassembled to remove the bond form. The bond must be in accordance with Item 2 of the specifications.

Any addenda issued amending this proposal and/or the plans that have been acknowledged by the bidder, become part of this proposal.

By signing the proposal the bidder certifies:

1. the only persons or parties interested in this proposal are those named and the bidder has not directly or indirectly participated in collusion, entered into an agreement or otherwise taken any action in restraint of free competitive bidding in connection with the above captioned project.
2. in the event of the award of a contract, the organization represented will secure bonds for the full amount of the contract.
3. the signatory represents and warrants that they are an authorized signatory for the organization for which the bid is submitted and they have full and complete authority to submit this bid on behalf of their firm.
4. that the certifications and representations contained in the proposal are true and accurate and the bidder intends the proposal to be taken as a genuine government record.

• **Signed: ****

(1) _____ (2) _____ (3) _____

Print Name:

(1) _____ (2) _____ (3) _____

Title:

(1) _____ (2) _____ (3) _____

Company:

(1) _____ (2) _____ (3) _____

- Signatures to comply with Item 2 of the specifications.

****Note:** Complete (1) for single venture, through (2) for joint venture and through (3) for triple venture.

*** When the working days field contains an asterisk (*) refer to the Special Provisions and General Notes.**

NOTICE TO CONTRACTORS

ANY CONTRACTORS INTENDING TO BID ON ANY WORK TO BE AWARDED BY THIS DEPARTMENT MUST SUBMIT A SATISFACTORY “AUDITED FINANCIAL STATEMENT” AND “EXPERIENCE QUESTIONNAIRE” AT LEAST TEN DAYS PRIOR TO THE LETTING DATE.

UNIT PRICES MUST BE SUBMITTED IN ACCORDANCE WITH ITEM 2 OF THE STANDARD SPECIFICATIONS OR SPECIAL PROVISION TO ITEM 2 FOR EACH ITEM LISTED IN THIS PROPOSAL.

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
1	316	2778	016	AGGR (TY-B GR-4) DOLLARS and CENTS	CY	3,699.000	1
1	316	2780	016	ASPH(AC-15P AC-20-5TR AC-20XP AC-10-2TR DOLLARS and CENTS	GAL	110,969.000	2
	354	2045		PLANE ASPH CONC PAV (2") DOLLARS and CENTS	SY	358,379.000	3
	354	2147		PLANE ASPH CONC PAV (0" TO 4 1/2") DOLLARS and CENTS	SY	11,511.000	4
	429	2011	008	CNC STR REP (REMOVE & REPLACE) DOLLARS and CENTS	CY	8.250	5
	454	2007	003	HEADER TYPE EXPANSION JOINT DOLLARS and CENTS	CF	233.000	6
	454	2008	003	JOINT SEALANT DOLLARS and CENTS	LF	1,712.000	7
	500	2001	011	MOBILIZATION DOLLARS and CENTS	LS	1.000	8
	502	2001	033	BARRICADES, SIGNS AND TRAFFIC HAN- DLING DOLLARS and CENTS	MO	5.000	9
	533	2006	014	SHOULDER TEXTURING (MILLED)(ASPHALT) DOLLARS and CENTS	LF	128,828.000	10

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	540	2001	031	MTL W-BEAM GD FEN (TIM POST) DOLLARS and CENTS	LF	212.500	11
	540	2002	031	MTL W-BEAM GD FEN (STEEL POST) DOLLARS and CENTS	LF	12.500	12
	540	2011	031	MTL BEAM GD FEN TRANS (THRIE-BEAM) DOLLARS and CENTS	EA	46.000	13
	540	2044	031	DOWNSTREAM ANCHOR TERMI- NAL(DAT)SECTION DOLLARS and CENTS	EA	10.000	14
	542	2001		REMOVING METAL BEAM GUARD FENCE DOLLARS and CENTS	LF	1,125.000	15
	542	2002		REMOVING TERMINAL ANCHOR SECTION DOLLARS and CENTS	EA	9.000	16
	662	2004		WK ZN PAV MRK NON-REMOV (W) 4" (SLD) DOLLARS and CENTS	LF	97,616.000	17
	662	2005		WK ZN PAV MRK NON-REMOV (W) 6" (BRK) DOLLARS and CENTS	LF	19,940.000	18
	662	2012		WK ZN PAV MRK NON-REMOV (W) 8" (SLD) DOLLARS and CENTS	LF	17,929.000	19
	662	2032		WK ZN PAV MRK NON-REMOV (Y) 4" (SLD) DOLLARS and CENTS	LF	103,662.000	20

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	666	2036		REFL PAV MRK TY I (W) 8" (SLD)(100MIL) DOLLARS and CENTS	LF	17,929.000	21
	668	2145		PREFAB PAV MRK TY C (W) (NUMBER) DOLLARS and CENTS	EA	10.000	22
	672	2017	034	REFL PAV MRKR TY II-C-R DOLLARS and CENTS	EA	1,897.000	23
	1122	2049	002	BIOGRD EROSN CONT LOGS (18" DIA)INSTALL DOLLARS and CENTS	LF	690.000	24
	1122	2056	002	BIODEGRADBLE EROSION CONTROL LOGS REMOV DOLLARS and CENTS	LF	690.000	25
2	3142	2003		UTBHMWC (ASPHALT)(PG 76-22) DOLLARS and CENTS	TON	91.000	26
2	3142	2007		UTBHMWC (MEMBRANE) DOLLARS and CENTS	GAL	10,617.000	27
2	3142	2009		UTBHMWC (AGGREGATE) (TY C) DOLLARS and CENTS	TON	1,715.000	28
	3270	2064		SUPERPAVE MIXTURES SP-C SAC-B PG76-22 DOLLARS and CENTS	TON	40,764.000	29
	6834	2001	002	PORTABLE CHANGEABLE MESSAGE SIGN DOLLARS and CENTS	DAY	105.000	30

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	8251	2006	005	RE PM W/RET REQ TY I(W)4"(SLD)(100MIL) DOLLARS and CENTS	LF	97,616.000	31
	8251	2009	005	RE PM W/RET REQ TY I(W)6"(BRK)(100MIL) DOLLARS and CENTS	LF	19,940.000	32
	8251	2018	005	RE PM W/RET REQ TY I(Y)4"(SLD)(100MIL) DOLLARS and CENTS	LF	103,662.000	33
				ALTERNATE NO. 1A DOLLARS and CENTS			
	3233	2001		MEMBRANE UNDERSEAL DOLLARS and CENTS	GAL	73,976.000	34
				ALTERNATE NO. 2A DOLLARS and CENTS			
	316	2778	016	AGGR (TY-B GR-4) DOLLARS and CENTS	CY	425.000	35
	316	2780	016	ASPH(AC-15P AC-20-5TR AC-20XP AC-10-2TR DOLLARS and CENTS	GAL	12,741.000	36
	3283	2008		TSM TOM (AGGREGATE) SAC A DOLLARS and CENTS	TON	1,648.000	37
	3283	2010		TSM TOM (ASPHALT) PG 76-22 DOLLARS and CENTS	TON	105.000	38
				ALTERNATE NO. 2B DOLLARS and CENTS			

ALT	ITEM-CODE			UNIT BID PRICE ONLY. WRITTEN IN WORDS	UNIT	APPROX QUANTITIES	DEPT USE ONLY
	ITEM NO	DESC CODE	S.P. NO.				
	3233	2001		MEMBRANE UNDERSEAL DOLLARS and CENTS	GAL	8,493.000	39
	3283	2008		TSM TOM (AGGREGATE) SAC A DOLLARS and CENTS	TON	1,648.000	40
	3283	2010		TSM TOM (ASPHALT) PG 76-22 DOLLARS and CENTS	TON	105.000	41

Project Number:

Sheet:

County: BEXAR

Control: 0521-06-135

Highway: IH 410

*****GENERAL NOTES*****

===== **Basis of Estimate** =====

===== **Asphalt Concrete Pavement** =====

Type	Location	Depth	Rate	Area	Quant-Tons
Superpave SP-C PG 76-22	NB Rdwy & Ramps	2 IN	110LBS/SY/IN	186,718 SY	20,574 TONS
SP-C PG 76-22	SB Rdwy & Ramps	2 IN	110LBS/SY/IN	183,176 SY	<u>20,184 TONS</u>
				Total	40,764 TONS

===== **Surface Treatment Data (For Use with Superpave)** =====

Base Bid 1

Description	One Course Surface Treatment
Area	369,894 sy
Asph--Type	(AC-15P, AC-20-5TR, AC-20XP, AC-10-2TR)
Asph--Rate (gal/sy)	0.30/1 = 110,969 GAL
Aggr--Type/gr	(TY-B, GR-4)
Aggr--Rate (cy/sy)	1/100 = 3,699 CY

Alternate Bid 1

Description	Membrane Underseal
Area	369,894 sy
Rate (gal/sy)	0.20/1 = 73,976 Gal

===== **UTBHMWC** =====

Base Bid 2

Description	Location
¾" Ultra Thin Bonded Hot Mix Wearing Course	IH 410/IH 37 Connector Ramps

Area/Rate 42,468 SY x 85 LBS/SY = 1,806 TONS

Membrane – Rate (GAL/SY)	0.25/1 = 10,617 GAL
Asphalt – Rate (0.05 x TONS)	0.05 = 91 TONS
Aggregate – Rate (0.95 x TONS)	0.95 = 1,715 TONS

Project Number:

Sheet:

County: BEXAR

Control: 0521-06-135

Highway: IH 410

===== **TSM TOM (Alternate to UTBHMWC)** =====
Alternate Bid 2 (A & B)

Description	Location
¾" Thin Surface Mixtures (TSM)	IH 410/IH 37 Connector Ramps

Area/Rate 42,465 SY x 110 LBS/SY/IN = 1,753 TONS

Asphalt – Rate (0.06 x TONS) 0.06 = 105 TONS

Aggregate – Rate (0.94 x TONS) 0.94 = 1,648 TONS

===== **Surface Treatment Data (For Use with TSM TOM)** =====

Alternate Bid 2A

Description	One Course Surface Treatment
Area	42,465 SY
Asph--Type	(AC-15P, AC-20-5TR, AC-20XP, AC-10-2TR)
Asph--Rate (gal/sy)	0.30/1 = 12,741 GAL
Aggr--Type/gr	(TY-B, GR-4)
Aggr--Rate (cy/sy)	1/100 = 425 CY

Alternate Bid 2B

Description	Membrane Underseal
Area	42,465 SY
Rate (gal/sy)	0.20/1 = 8,493 GAL

Contact the Engineer or the City when construction operations are within 400 feet of a signalized intersection to determine/verify the location of loop detectors, conduit, ground-boxes, etc. Repair or replace any signal equipment damaged by construction operations. The method of repair or replacement shall be pre-approved and inspected. Depending on the type and extent of the damage, the Engineer reserves the right to perform the repair or replacement work and the Contractor will be billed for this work.

Remove existing raised pavement markings as the work progresses or as approved. This work is subsidiary to the various bid items. Properly dispose materials removed.

If there are waste areas or material source areas, follow the Texas Aggregate Quarry and Pit Safety Act requirements.

Project Number:

Sheet:

County: BEXAR

Control: 0521-06-135

Highway: IH 410

Any materials removed and not reused and determined to be salvageable shall be stored within the project limits at an approved location or delivered undamaged to the storage yard as directed. Properly dispose unsalvageable materials in accordance with local, state, and federal regulations. Deface traffic signs so that they will not reappear in public as signs.

Notify the Engineer at least two weeks prior to a proposed traffic pattern change(s) that will require a revision to traffic signals.

Hurricane Evacuation

Hurricane Season is from June 1 thru November 30. As the closest metropolitan city inland from the Texas Coast, the City of San Antonio is a major shelter destination during mandatory hurricane evacuations. As such, planned work zone lane or road closures may be restricted and/or suspended during mandatory hurricane evacuation operations. The District will coordinate these restrictions at a minimum H-120 from any projected impact to the Texas Coast.

No time charges will be made if the Engineer determines that work on the project was impacted by the hurricane.

The Engineer may order changes in the Traffic Control Plan to accommodate evacuation traffic, and may suspend the work, all or in part, to ensure timely completion of this work. All work to implement changes in the Traffic Control Plan will be paid through existing bid prices or through Item 9.5, Force Account. However, the Department will not entertain any request for delay damages, loss of efficiency that may be attributed to the restriction or suspension of road or lane closures, or to changes in the Traffic Control Plan.

The Contractor should be aware that the "City Public Service" (CPS) will be consulted by the Engineer in matters concerning the execution of the work, materials and testing related to the CPS work. As such; a CPS employee may be observing the construction and related operations as they progress.

--Item 5--

Reference all existing striping and other pavement markings to allow these markings to be re-established. Ensure the markings (lane lines, edge lines, ramp gores, etc.) are in line with signs, TMS arrows, etc. located on overhead sign supports.

Taper ACP placed at curb inlets, traffic inlets and slotted drains.

When a bridge deck is milled, seal coated and overlaid, remove excess material. Do not just broom to the sides of the bridge, under guardrail, etc. Cover or protect all sealed expansion joints and rails on bridges and all railroad tracks encountered as approved. Clean all of these features if they weren't properly protected. This work is subsidiary work to applicable bid items.

Project Number:

Sheet:

County: BEXAR

Control: 0521-06-135

Highway: IH 410

When working near aerial electrical lines or utility poles, comply with Federal, State and local regulations. For electrical lines and poles shown in the plans, if the lines need to be de-energized or if poles need to be braced, contact the electrical company. Work pertaining to de-energizing lines, bracing poles and other protective measures will not be paid by TxDOT.

Prevention of Migratory Bird Nesting

It is anticipated that migratory birds, a protected group of species, may try to nest on bridges, culverts, vegetation, or gravel substrate, at any time of the year. The preferred nesting season for migratory birds is from February 15 through October 1. When practicable, schedule construction operations outside of the preferred nesting season. Otherwise, nests containing migratory birds must be avoided and no work will be performed in the nesting areas until the young birds have fledged.

Structures

Bridge and culvert construction operations can not begin until swallow nesting prevention is implemented, until after October 1 if it's determined that swallow nesting is actively occurring, or until it's determined swallow nests have been abandoned. If the State installed nesting deterrent on the bridges and culverts, maintain the existing nesting deterrent to prevent swallow nesting until October 1 or completion of the bridge and culvert work, whichever occurs earlier. If new nests are built and occupied after the beginning of the work, do not perform work that can interfere with or discourage swallows from returning to their nests. Prevention of swallow nesting can be performed by one of the following methods:

1. By February 15 begin the removal of any existing mud nests and all other mud placed by swallows for the construction of nests on any portion of the bridge and culverts. The Engineer will inspect the bridges and culverts for nest building activity. If swallows begin nest building, scrape or wash down all nest sites. Perform these activities daily unless the Engineer determines the need to do this work more frequently. Remove nests and mud through October 1 or until bridge and culvert construction operations are completed.
2. By February 15 place a nesting deterrent (which prevents access to the bridge and culvert by swallows) on the entire bridge (except deck and railing) and culverts.

No extension of time or compensation payment will be granted for a delay or suspension of work caused by nesting swallows. This work is subsidiary to the various bid items.

Provide a non-intrusive back-up alarm system on all heavy equipment used in close proximity to residential areas. This item is subsidiary to various bid items.

--Item 6--

Show the stockpile lot and/or sub lot numbers on all tickets for all materials.

Project Number:

Sheet:

County: BEXAR

Control: 0521-06-135

Highway: IH 410

--Item 7--

The total disturbed areas within the project is anticipated at less than one (1) acre. Due to this type of construction, the project qualifies for exclusion under the Construction General Permit (CGP) issued by the Texas Commission on Environmental Quality (TCEQ) on March 5, 2008. However; should the sum of the Engineer's anticipated disturbances and the Contractor's (On ROW and off ROW) PSL's equal or exceed the one (1) acre threshold; both TxDOT and the Contractor have project responsibilities under the CGP that reverts to non-exclusion status. Obtain approval for all non-depicted areas of disturbance that increases the initial soil and vegetation disturbed area estimates before work starts at these locations.

Notify the Engineer of the disturbed acreage within one (1) mile of the project limits. Obtain authorization from the TCEQ for Contractor PSL's for construction support activities on or off ROW.

--Item 8--

Working days will be computed and charged in accordance with Article 8.3.C.2.a

Lane Rental Fees - Include SP 008-151

The Lane Rental Charges are shown in the plans on the Lane Closure Fee Schedule Sheet. The Lane Closure Fee Schedule applies to IH 410 main lanes and ramp closures or obstructions of the lanes that overlap into restricted hour traffic for each hour, per lane, per mile. The length of each closure is measured from the point of the lane closure taper and is measured to the point where traffic is opened up to preconstruction configuration.

Unless otherwise shown in the plans, directed or approved, the contractor shall limit lane closures to the approved hours listed in the Lane Closure Fee Schedule sheet in the plans.

If the Contractor fails to re-open closed lanes and / or ramps on time, late charges will be assessed as shown on the Lane Closure Fee Schedule sheet in the plans.

--Item 9--

When approved, provide uniformed, off-duty law enforcement officers with marked vehicles during work that requires a lane closure. The officer in marked vehicles shall be located as approved to monitor or direct traffic during the closure. The method used to direct traffic at signalized intersections shall be as approved. Additional officers and vehicles may be provided when approved or directed.

Complete the daily tracking form provided by the department and submit invoices that agree with the tracking form for payment at the end of each month approved services were provided.

Project Number:

Sheet:

County: BEXAR

Control: 0521-06-135

Highway: IH 410

Minimums, scheduling fees, etc. will not be paid; TxDOT will consider paying cancellation fees on a case by case basis.

--Item 316--

Asphalt season will be year around, but meet sections 316.4.D.1 through 3.

Ensure that the asphalt for pre-coating the aggregate and the asphalt used for the surface treatment will not result in a reaction that may adversely affect the bonding of the aggregate and asphalt during the surface treatment operation.

Do not add bag house fines in the production of precoated material.

Clean all concrete curbs, islands, medians, etc. that get coated with asphalt.

--Item 320--

Construct all longitudinal ACP joints adjacent to a travel lane with a joint maker device that will create a 3:1 to 6:1 taper. For placement of 2 inches or more, the device shall provide a maximum ½ inch vertical edge. Taper outside edges (next to the grass) or backfill (shoulder-up) the same day.

Provide a material transfer device capable of providing a continuous flow of material to the paver. The material transfer device will consist of a windrow elevator or better.

--Item 330--

The asphalt plant shall have truck scales as defined in Item 520. Give three weight tickets bearing the date, the truck number, and the gross, net & tare weights to the truck driver, for the State inspector at the spreading and finishing operation. Trucks may be required to weigh on public scales or portable platform scales to verify the weight of the ticket.

The fluxing material shall be either an emulsified combination of asphalt and softening agent added individually (the softening agent may also be an emulsion), or a material meeting the requirements of Item "Asphalt's, Oils and Emulsions". The material(s) selected shall be approved.

--Item 354—

Retain planed material.

Take precaution to avoid damage to existing bridge decks and armor joints. Repair any damage to the bridge decks and/or armor joints as approved, at Contractor's expense.

Project Number:

Sheet:

County: BEXAR

Control: 0521-06-135

Highway: IH 410

--Item 421--

Use an automated ticket that contains the same information as TxDOT's ticket. Submit the ticket for approval prior to use. The concrete producer will contact the District Laboratory or the Engineer's Office (outside the San Antonio area) to inform TxDOT of scheduled structural concrete batching. Structural concrete includes bridge drill shafts, columns, caps, abutments, deck or top slabs of direct traffic culverts.

Entrained air is allowed for Class P and Class HES concrete only. Air content testing is waived for all classes of concrete.

The curing facilities and strength testing equipment is not required for this project.

Poly-fiber reinforced concrete may be used as an option, with the approval by the Engineer, for riprap, sidewalk, curb/gutter, and mow strip. Use a TxDOT approved manufacturer or producer for the poly-fiber. The poly-fibers shall be combined with the concrete in proportions as recommended by the manufacturer. A concrete mix design must be approved by the Engineer.

--Item 454--

The list of approved Header Type Expansion Joints can be found at:
http://www.txdot.gov/txdot_library/publications/producer_list.htm title is "Elastomeric Concrete".

--Item 500--

"Materials on Hand" payments will not be considered in determining percentages for mobilization payments.

--Item 502--

The Contractor Force Account "Safety Contingency" that has been established for this project is intended to be utilized for work zone enhancements, to improve the effectiveness of the Traffic Control Plan, that could not be foreseen in the project planning and design stage. These enhancements will be mutually agreed upon by the Engineer and the Contractor's Responsible Person based on weekly or more frequent traffic management reviews on the project. The Engineer may choose to use existing bid items if it does not slow the implementation of enhancement.

Place standard markings no later than 14 days after surface treatment operations are completed.

When advanced warning flashing arrow panels and/or changeable message sign is specified, have one standby unit in good condition at the job site.

Treat the pavement drop-offs as shown in the TCP.

Project Number:

Sheet:

County: BEXAR

Control: 0521-06-135

Highway: IH 410

After written notification, the time frame to provide properly maintained signs and barricades before considered in non-compliance is 48 hours from receipt of the notification.

Notify the Engineer 5 business days in advance of any temporary or permanent lane, ramp, connector, etc. closures/detours, restrictions to lane widths, alterations to vertical clearances, or modifications to radii. Any other modifications to the roadway that may adversely affect the mobility of oversized/overweight trucks also require 5 business days advance notice to the Engineer. Unless shown in the TCP, no lane, ramp, connector, etc. closures are allowed during special events. At least one lane has to remain open at all times. For all lane closures, provide written closure information by 1:00PM on the business day prior to the closure. For closures on a Monday or following a Holiday, furnish the information the workday prior to the closure. Lane closures will not be allowed if this reporting requirement is not met.

For closures not listed in the TCP; the lane closures are limited to between the hours of 9:00 PM to 6:00 AM, and at least one lane has to remain open at all times.

Avoid placing stockpiles within the roadway's horizontal clear zone. If a stockpile is placed within the clear zone, address in accordance with the TMUTCD.

Do not place barricades, signs, or any other traffic control devices where they interfere with sight distance at driveways or side streets.

In addition to providing a Contractor's Responsible Person and a phone number for emergency contact, have an employee available to respond on the project for emergencies and for taking corrective measures within 2 hours or within a reasonable time frame as specified by the Engineer.

Temporary Rumble Strips are to be used according to WZ (RS)-14.

Use 2 rumble strip arrays as shown in Table 1.

--Item 540--

MBGF posts shall be round with domed tops, and not painted. If 10 or less timber posts are needed, they may be purchased locally and will be accepted by visual inspection.

Guard fence posts placed in proposed and/or existing areas of riprap, sidewalks or other concrete shall have an 18 inch +/- (square or round) block out in the concrete. After the posts are installed, the blocked out area shall be topped off with 4 inches of low strength grout/mortar consisting of about 1 sack of cement per cubic yard of mix.

When connecting a Thrie-Beam to a concrete wingwall, bridge rail, CTB, etc., drill the holes for bolt placement using rotary or core type equipment. Use a core type drill when reinforcing steel

Project Number:

Sheet:

County: BEXAR

Control: 0521-06-135

Highway: IH 410

is encountered. Do not use percussion or impact drilling. Repair damage to the concrete and spalls exceeding 1/2" from the edge of the hole.

All guard rail elements for this project are 6.25' in length and are to be used in conjunction with the three beam elements to allow for tying existing metal beam guard fence to bridge rail.

--Item 542--

Salvage all undamaged/acceptable radius guardrail and deliver to the TxDOT maintenance section yard.

--Item 585--

Use Surface Test Type B, pay adjustment schedule 3 to evaluate ride quality of travel lanes.

--Item 662--

For this project, Work Zone Pavement Markings (Non removable) shall consist of TY II Markings, Traffic Paint and Glass Traffic Beads as per Item 666.

--Item 666 & 8251--

If TY II material is used (vs. an acrylic or epoxy) as the sealer for the TY I markings, place the TY II a minimum of 14 calendar days (to provide adequate curing) before placing the TY I markings.

--Item 672--

Place all adhesive material directly from the heated dispenser to the pavement. Do not use portable or non-heated containers. Use adhesive of sufficient thickness so that when the marker is pressed into the adhesive, 1/8" or more adhesive will remain under 100% of the marker. The adhesive should extend not less than 1/2" but not more than 1 1/2" beyond the perimeter of the marker.

--Item 1122--

An Inspector will perform a regularly scheduled SWP3 inspection every 7 calendar days.

--Item 3142, 3270--

Table 10, in Item 3267, Table 10 in Item 3268 and Table 11 in Item 3270, Hamburg Wheel Test Requirements tested in accordance with Tex-242-F are changed for PG 64-22 or lower and PG 70-22. Minimum number of passes at 1/2" Rut Depth, Tested at 122 degrees F will be 5,000 and 10,000 respectively.

The asphalt plant shall have truck scales as defined in Item 520. Give three weight tickets bearing the date, the truck number, the gross, net & tare weights to the truck driver for the State inspector at the spreading and finishing operation. Trucks may be required to weigh on public scales or portable platform scales to verify the weight of the ticket.

Project Number:

Sheet:

County: BEXAR

Control: 0521-06-135

Highway: IH 410

Submit a copy of the Tex 233-F production charts on a weekly basis. At the end of the ACP work, provide all originals.

Crushing of aggregate for hot mix and immediate use for production of the mix is not allowed. Stockpile the aggregate until enough material is available for five days of production unless prior approval is provided. Hold a pre-placement meeting one month prior to the placement of the hot mix.

The main purpose of hot mix cores taken by the State are for payment calculations. If (for quality control purposes) the core information is needed sooner, take additional cores.

Do not use diesel or solvents as asphalt release agents in production, transportation, or construction. A list of approved asphalt release agents is available from the District Laboratory.

No more than one hot mix lot will be open for any specific type of hot mix, unless authorized. After a lot is open and the Contractor gets approval to change plants, the previous lot will be closed and a new lot will be opened. The numbering for the lots produced at the new plant will start with No. 1. If allowed to switch back to the original or previous plant, the next lot from that plant will resume numbering sequentially from the last lot produced by that plant.

Schedule lay-down placement where uneven travel lanes are minimized and eliminated weekly.

If asphalt material is obtained from other than a commercial source presently inspected by TxDOT, furnish a Type D structure for the asphalt mix control laboratory for the Engineer's use. Provide a minimum height of 8 feet and a minimum of 400 square feet of gross floor area for permanently located asphalt plants or 200 square feet for a temporary plant. The floor area will be partitioned into a minimum of two rooms, with a minimum of two windows per room. The floor shall have an impervious cover and sufficient strength to support the testing equipment. Portable structures shall be support blocked for stability and shall be tied down.

Recycled Asphalt Shingles (RAS) will not be allowed in the final riding surface.

Minimum Roadway Placement Temperature

--Item 3142--

Place mixture when the roadway surface temperature is equal to or higher than listed in Table 1 unless otherwise approved or shown on the plans. Measure the roadway surface temperature with a handheld infrared thermometer. Placement may be allowed to begin prior to the roadway surface reaching the required temperature if conditions are such that the roadway surface will reach the required temperature within 2 hrs. of beginning placement operations. Place mixtures only when weather and moisture conditions of the roadway surface are suitable in the opinion of the Engineer.

Project Number:

Sheet:

County: BEXAR

Control: 0521-06-135

Highway: IH 410

Table 1
Minimum Pavement Surface Temperatures

		Minimum Pavement Surface Temperatures in Degrees Fahrenheit *	
Specification Item Number	High Temperature Binder Grade	Subsurface Layers or Night Paving Operations	Surface Layers Placed in Daylight Operations
SS 3267	PG 64	45	50
	PG 70	55	60
	PG 76	60	60
SS 3127, SS 3142, SS 3269 & SS 3271	PG 76	65	70
	Asphalt Rubber (A-R)	65	70

* Except for PG 64, may pave at temperatures 10° F lower than the values shown in Table 1 when utilizing a paving process or equipment that eliminates thermal segregation. In these cases, use either an infrared bar attached to the paver, or a hand held thermal camera, or a hand held infrared thermometer operated in accordance with Text Method 244-F to demonstrate that the uncompacted mat has no more than 10° F of thermal segregation.

CONTROL : 0521-06-135
PROJECT : STP 2015(290)HES
HIGHWAY : IH 410
COUNTY : BEXAR

TEXAS DEPARTMENT OF TRANSPORTATION

GOVERNING SPECIFICATIONS AND SPECIAL PROVISIONS

ALL SPECIFICATIONS AND SPECIAL PROVISIONS APPLICABLE TO THIS PROJECT
ARE IDENTIFIED AS FOLLOWS:

STANDARD SPECIFICATIONS: ADOPTED BY THE TEXAS DEPARTMENT OF
----- TRANSPORTATION JUNE 1, 2004.
STANDARD SPECIFICATIONS ARE INCORPORATED
INTO THE CONTRACT BY REFERENCE.

ITEMS 1 TO 9 INCL., GENERAL REQUIREMENTS AND COVENANTS
ITEM 316 SURFACE TREATMENTS (210)(300)(302)(520)
ITEM 354 PLANING AND TEXTURING PAVEMENT
ITEM 429 CONCRETE STRUCTURE REPAIR (420)(421)(440)
ITEM 454 BRIDGE EXPANSION JOINTS (429)(442)
ITEM 500 MOBILIZATION
ITEM 502 BARRICADES, SIGNS, AND TRAFFIC HANDLING
ITEM 533 SHOULDER TEXTURING
ITEM 540 METAL BEAM GUARD FENCE (421)(445)(529)(542)(544)
ITEM 542 REMOVING METAL BEAM GUARD FENCE
ITEM 662 WORK ZONE PAVEMENT MARKINGS (666)(668)(672)(677)
ITEM 666 REFLECTORIZED PAVEMENT MARKINGS (316)(318)(662)(677)(678)
ITEM 668 PREFABRICATED PAVEMENT MARKINGS
ITEM 672 RAISED PAVEMENT MARKERS (677)(678)

SPECIAL PROVISIONS: SPECIAL PROVISIONS WILL GOVERN AND TAKE
----- PRECEDENCE OVER THE SPECIFICATIONS ENUMERATED
HEREON WHEREVER IN CONFLICT THEREWITH.

REQUIRED CONTRACT PROVISIONS, FEDERAL-AID CONSTRUCTION CONTRACTS
(FORM FHWA 1273, MAY, 2012)

WAGE RATES

SPECIAL PROVISION "NOTICE TO ALL BIDDERS" (000---003)
SPECIAL PROVISION "NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO
ENSURE EQUAL EMPLOYMENT OPPORTUNITY" (000---004)
SPECIAL PROVISION "STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY
CONSTRUCTION CONTRACT SPECIFICATIONS" (000---006)
SPECIAL PROVISION "CERTIFICATION OF NONDISCRIMINATION IN EMPLOYMENT"

(000---009)

SPECIAL PROVISION "DEPARTMENT DIVISION MAILING AND PHYSICAL ADDRESS"
(000---011)

SPECIAL PROVISION "NOTICE OF CHANGES TO U.S. DEPARTMENT OF LABOR
REQUIRED PAYROLL INFORMATION" (000--1483)

SPECIAL PROVISION "ON-THE-JOB TRAINING PROGRAM" (000--2638)

SPECIAL PROVISION "DISADVANTAGED BUSINESS ENTERPRISE IN FEDERAL AID
CONTRACTS" (000--1966)

SPECIAL PROVISION "PARTNERING" (000--2329)

SPECIAL PROVISION "SCHEDULE OF LIQUIDATED DAMAGES" (000--2332)

SPECIAL PROVISION "NONDISCRIMINATION" (000--2607)

SPECIAL PROVISION "IMPORTANT NOTICE TO CONTRACTORS" (000--2839)

SPECIAL PROVISION TO ITEM 1 (001---015)

SPECIAL PROVISION TO ITEM 2 (002---017)

SPECIAL PROVISION TO ITEM 3 (003---033)

SPECIAL PROVISION TO ITEM 4 (004---017)

SPECIAL PROVISION TO ITEM 5 (005---004)

SPECIAL PROVISIONS TO ITEM 6 (006---030)(006---047)

SPECIAL PROVISION TO ITEM 7 (007---918)

SPECIAL PROVISIONS TO ITEM 8 (008---006)(008---119)(008---151)

SPECIAL PROVISIONS TO ITEM 9 (009---009)(009---015)

SPECIAL PROVISION TO ITEM 161 (161---006)

SPECIAL PROVISION TO ITEM 300 (300---039)

SPECIAL PROVISION TO ITEM 302 (302---010)

SPECIAL PROVISION TO ITEM 316 (316---016)

SPECIAL PROVISION TO ITEM 318 (318---010)

SPECIAL PROVISION TO ITEM 421 (421---035)

SPECIAL PROVISION TO ITEM 429 (429---008)

SPECIAL PROVISION TO ITEM 440 (440---006)

SPECIAL PROVISION TO ITEM 442 (442---016)

SPECIAL PROVISION TO ITEM 454 (454---003)

SPECIAL PROVISION TO ITEM 500 (500---011)

SPECIAL PROVISION TO ITEM 502 (502---033)

SPECIAL PROVISION TO ITEM 533 (533---014)

SPECIAL PROVISION TO ITEM 540 (540---031)

SPECIAL PROVISION TO ITEM 672 (672---034)

SPECIAL PROVISION TO SPECIAL SPECIFICATION ITEM 1122 (1122--002)

SPECIAL PROVISION TO SPECIAL SPECIFICATION ITEM 6834 (6834--002)

SPECIAL PROVISION TO SPECIAL SPECIFICATION ITEM 8251 (8251--005)

SPECIAL SPECIFICATIONS:

ITEM 1122 TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL
CONTROLS (161)(432)(556)

ITEM 3142 ULTRA-THIN BONDED HOT MIX WEARING COURSE (UTBHMWC) (210)
(300)(301)(320)(585)

ITEM 3233 SPRAY APPLIED UNDERSEAL MEMBRANE (320)

ITEM 3270 SUPERPAVE MIXTURES (210)(300)(301)(320)(520)(585)

ITEM 3283 THIN SURFACE MIXTURES (TSM) (300)(301)(320)(520)(585)

ITEM 6834 PORTABLE CHANGEABLE MESSAGE SIGN

ITEM 8094 MOBILE RETROREFLECTIVITY DATA COLLECTION FOR PAVEMENT
MARKINGS

ITEM 8251 REFLECTORIZED PAVEMENT MARKINGS WITH RETROREFLECTIVE
REQUIREMENTS (316)(318)(502)(677)(678)(8094)

GENERAL: THE ABOVE-LISTED SPECIFICATION ITEMS ARE THOSE UNDER WHICH
----- PAYMENT IS TO BE MADE. THESE, TOGETHER WITH SUCH OTHER
PERTINENT ITEMS, IF ANY, AS MAY BE REFERRED TO IN THE ABOVE-
LISTED SPECIFICATION ITEMS, AND INCLUDING THE SPECIAL
PROVISIONS LISTED ABOVE, CONSTITUTE THE COMPLETE SPECIFI-
CATIONS FOR THIS PROJECT.

SPECIAL SPECIFICATION

3142

Ultra-Thin Bonded Hot Mix Wearing Course (UTBHMWC)

1. **Description.** Construct a surface course composed of a warm spray-applied polymer modified emulsion membrane followed immediately with a hot plant mixed gap-graded paving mixture. Provide a wearing course with a minimum of 1/2 in. for Type A, 5/8 in. for Type B, and 3/4 in. for Type C.
2. **Materials.** Furnish materials of uniform quality throughout that meet the requirements of the plans and specifications. Notify the Engineer of all materials sources. Notify the Engineer before changing any material source or formulation. When making a source or formulation change, the Engineer will verify that the specification requirements are met and may require a new laboratory mixture design, trial batch, or both. The Engineer may sample and test project materials at any time throughout the duration of the project to verify specification compliance.
 - A. **Aggregate.** Furnish aggregates from sources that conform to the requirements shown in Table 1, and as specified in this Section, unless otherwise shown on the plans. Provide aggregate stockpiles that meet the definition in this Section. Do not use recycled asphalt pavement (RAP) or reclaimed asphalt shingles in ultra-thin bonded hot mix wearing course (UTBHMWC) mixtures. Supply mechanically crushed gravel or stone aggregates that meet the definitions in Tex-100-E. The Engineer will designate the plant or the quarry as the sampling location. Samples must be from materials produced for the project. The Engineer will establish the surface aggregate classification (SAC) and perform Los Angeles Abrasion, Magnesium Sulfate Soundness, and Micro-Deval tests. Perform all other aggregate quality tests listed in Table 1 and perform Tex-107-E on mineral fillers if used. Document all test results on the mixture design report. The Engineer may perform tests on independent or split samples to verify Contractor test results. Stockpile aggregates for each source and type separately. Determine aggregate gradations for mixture design and production testing based on Tex-200-F, Part II. Do not add material to an approved stockpile from sources that do not meet the aggregate quality requirements of the Department's Bituminous Rated Source Quality Catalog (BRSQC) unless otherwise approved.
 1. **Coarse Aggregate.** Coarse aggregate stockpiles must have no more than 20% material passing the No. 8 sieve. Provide aggregates from sources listed in the BRSQC. Provide non-listed sources only when tested by the Engineer and approved before use. Allow 30 calendar days for the Engineer to sample, test, and report results for non-listed sources.

Provide coarse aggregate with a minimum SAC Class A requirement. SAC requirements only apply to aggregates used on the surface of travel lanes, unless otherwise shown on the plans. The SAC for sources on the Department's Aggregate Quality Monitoring Program (AQMP) are listed in the BRSQC.

Unless otherwise shown on the plans, Class B aggregate meeting all other requirements in Table 1 may be blended with a Class A aggregate in order to meet requirements for Class A materials. When blending Class A and B aggregates to meet a Class A requirement, ensure at least 50% by weight of the material retained on the No. 4 sieve comes from the Class A aggregate source. Blend by volume if the bulk specific gravities of the Class A and B aggregates differ by more than 0.300. When blending, do not use Class C or D aggregates.

2. **RAP.** Do not use RAP in UTBHMWC mixtures.
3. **Fine Aggregate.** Fine aggregates consist of manufactured sands and screenings. Fine aggregate stockpiles must meet the gradation requirements in Table 2. Supply fine aggregates that are free from organic impurities. The Engineer may test the fine aggregate in accordance with Tex-408-A to verify the material is free from organic impurities. Do not use field sand or other uncrushed fine aggregate. Use fine aggregate from coarse aggregate sources that meet the requirements shown in Table 1, unless otherwise approved.

Table 1
Aggregate Quality Requirements

Property	Test Method	Requirement
Coarse Aggregate Properties		
SAC	AQMP	Class A
Deleterious Material, %, Max	Tex-217-F, Part I	1.0
Decantation, %, Max	Tex-217-F, Part II	1.5
Micro-Deval Abrasion, %, Max	Tex-461-A	Note 1
Los Angeles Abrasion, %, Max	Tex-410-A	35
Magnesium Sulfate Soundness, 5-Cycle, %, Max	Tex-411-A	20
Coarse Aggregate Angularity, 2 Crushed Faces, %, Min	Tex 460-A, Part I	95 ²
Flat and Elongated Particles @ 5:1, %, Max	Tex 280-F	10
Fine Aggregate Properties		
Sand Equivalent, Min	Tex 203F	45
Methylene Blue, Max	AASHTO TP57-99	10

1. Not used for acceptance purpose. Used by the engineer as an indicator of the need for further investigation

2. Only applies to crushed gravel.

Table 2
Gradation Requirements for Fine Aggregate

Sieve Size	% Passing by Weight or Volume
3/8"	100
#8	70–100
#200	0–30

- B. Mineral Filler.** Mineral filler consists of finely divided mineral matter such as agricultural lime, crusher fines, hydrated lime, cement, or fly ash. Mineral filler is allowed unless otherwise shown on the plans. Do not use more than 2% hydrated lime or cement, unless otherwise shown on the plans. The plans may require or disallow specific mineral fillers. When used, provide mineral filler that:

- is sufficiently dry, free-flowing, and free from clumps and foreign matter;

- does not exceed 3% linear shrinkage when tested in accordance with Tex-107-E; and
- meets the gradation requirements in Table 3.

Table 3
Gradation Requirements for Mineral Filler

Sieve Size	% Passing by Weight or Volume
#8	100
#200	55–100

- C. Baghouse Fines.** Fines collected by the baghouse or other dust collecting equipment may be re-introduced into the mixing drum provided the final combined gradation meets the requirements in Table 6.
- D. Asphalt Binder.** Furnish performance grade (PG) asphalt binder for the paving mixture that meets requirements of Item 300.
- 1. PG Binder.** Provide an asphalt binder with a high temperature grade of PG76 and a low temperature grade as shown on the plans, in accordance with Section 300.2.J.
 - 2. Membrane.** Provide a smooth and homogeneous polymer modified emulsion meeting the requirements of Table 4.

Table 4
Polymer Modified Emulsion Requirements

Test on Emulsion	Test Method	Min	Max
Viscosity @ 77°F, SSF	T 72	20	100
Storage Stability ¹ , %	T 59		1
Demulsibility (for anionic emulsions), 35 ml of 0.02 N CaCl ₂ , %	T 59	55	
Demulsibility (for cationic emulsions), 35 ml 0.8% sodium dioctyl sulfosuccinate, %	T 59	55	
Sieve Test ² , %	T 59		0.05
Distillation Test: ³ Residue by distillation, % by wt. Oil portion of distillate, % by vol.	T 59	63	0.5
Test on Residue from Distillation	Test Method	Min	Max
Elastic Recovery @ 50°F, 50 mm/min, %	Tex-539-C	60	
Penetration @ 77°F, 100 g, 5 sec, 0.1 mm	T 49	100	150

1. After standing undisturbed for 24 hours, the surface must be smooth, must not exhibit a white or milky colored substance, and must be a homogeneous color throughout.
2. May be required by the Engineer only when the emulsion cannot be easily applied in the field.
3. The temperature on the lower thermometer should be brought slowly to 350°F ± 10°F and maintained at this temperature for 20 minutes. The total distillation should be complete in 60 ± 5 minutes from the first application of heat.

- E. Additives.** When shown on the plans, use the type and rate of additive specified. Other additives that facilitate mixing or improve the quality of the mixture may be allowed when approved.

If lime or a liquid anti-stripping agent is used, add in accordance with Item 301. Do not add lime directly into the mixing drum of any plant where lime is removed through the exhaust stream, unless the plant has a baghouse or dust collection system that reintroduces the lime back into the drum.

- 3. Equipment.** Provide required or necessary equipment in accordance with Item 320.

- A. Spray Paver.** In addition to the requirements of Item 320, furnish a paver that will spray the membrane, apply the mixture, and level the surface of the mat in a single pass. Configure the paver so that the mixture is placed no more than 5 seconds after the membrane is applied. Ensure the paver does not support the weight of any portion of hauling equipment other than the connection. Provide loading equipment that does not transmit vibrations or other motions to the paver that adversely affect the finished pavement quality. Equip the paver with an automatic dual longitudinal-grade control system and an automatic transverse-grade control system.
- 1. Membrane Storage Tank and Distribution System.** Equip the paver with an insulated storage tank having a minimum capacity of 900 gallons. Provide a metered mechanical pressure sprayer on the paver to apply a uniform membrane at the specified rate. Locate the spray bar on the paver so that the membrane is applied immediately in front of the screed unit. Provide a read out device on the paver to monitor the membrane application rate.
 - 2. Screed.** In addition to meeting Item 320, provide a variable width vibratory screed.
- B. Material Transfer Devices.** In addition to the requirements of Item 320, ensure that no material is deposited on the roadway in front of the paver. Do not use windrow pick-up devices.
- C. Rollers.** Provide steel-wheel rollers meeting the requirements of Item 210, except provide rollers weighing a minimum of 10 tons for each roller required. Operate rollers in static (non-vibrating) mode unless otherwise allowed by the Engineer.
- 4. Construction.** Produce, haul, place, and compact the specified paving mixture. Schedule and participate in a pre-paving meeting, as required in the Quality Control Plan (QCP).
- A. Certification.** Personnel certified by the Department-approved program must conduct all mixture designs, sampling, and testing in accordance with Table 5. In addition to meeting the certification requirements in Table 5, all Level II certified specialists must successfully complete an approved Superpave (SP) training course. Supply the Engineer with a list of certified personnel and copies of their current certificates before beginning production and when personnel changes are made. Provide a mixture design that is developed and signed by a Level II certified specialist. Provide a Level IA certified specialist at the plant during production operations. Provide a Level IB certified specialist to conduct placement tests.

Table 5
Test Methods, Test Responsibility, and Minimum Certification Levels

1. Aggregate Testing	Test Method	Contractor	Engineer	Level
Sampling	Tex-400-A	✓	✓	IA
Dry Sieve	Tex-200-F, Part I	✓	✓	IA
Washed Sieve	Tex-200-F, Part II	✓	✓	IA
Deleterious Material	Tex-217-F, Part I	✓	✓	II
Decantation	Tex-217-F, Part II	✓	✓	II
Los Angeles Abrasion	Tex-410-A		✓	
Magnesium Sulfate Soundness	Tex-411-A		✓	
Micro-Deval	Tex-461-A		✓	
Coarse Aggregate Angularity	Tex-460-A	✓	✓	II
Sand Equivalency	Tex-203-F	✓	✓	II

1. Aggregate Testing	Test Method	Contractor	Engineer	Level
Methylene Blue	AASHTO TP57-99	✓	✓	II
Flat and Elongated Particles	Tex 280-F	✓	✓	II
2. Mix Design & Verification	Test Method	Contractor	Engineer	Level
Design and JMF Changes	Tex-204-F	✓	✓	II
Mixing	Tex-205-F	✓	✓	II
Molding (SGC)	Tex-241-F	✓	✓	II
Laboratory-molded Density	Tex-207-F	✓	✓	II
Rice Gravity	Tex-227-F	✓	✓	IA
Ignition Oven Calibration ¹	Tex-236-F	✓	✓	II
Drain-down	Tex-235-F	✓	✓	IA
Boil Test	Tex-530-C	✓	✓	IA
Cantabro Loss	Tex-245-F	✓	✓	II
3. Production Testing	Test Method	Contractor	Engineer	Level
Control Charts	Tex-233-F	✓	✓	IA
Mixture Sampling	Tex-222-F	✓	✓	
Gradation & Asphalt Content ¹	Tex-236-F	✓	✓	IA
Moisture Content	Tex-212-F	✓	✓	IA
Micro-Deval	Tex-461-A		✓	
Drain-down	Tex-235-F	✓	✓	IA
Boil Test	Tex-530-C	✓	✓	IA
Aging Ratio	Tex-211-F		✓	
4. Placement Testing	Test Method	Contractor	Engineer	Level
Control Charts	Tex-222	✓	✓	IA
Ride Quality Measurement	Tex-1001-S	✓	✓	IB
Thermal profile	Tex-244-F	✓	✓	IB
Permeability	Tex-246-F	✓	✓	IB

1. Refer to Section 4.E for exceptions to using ignition oven.

- B. Reporting.** Use Department-provided software to record and calculate all test data. The Engineer and the Contractor will provide any available test results to the other party when requested. The Engineer and the Contractor will immediately report to the other party any test result that requires production to be suspended or fails to meet the specification requirements. Use the approved communication method (e.g., email, diskette, hard copy) to submit test results to the Engineer.

When directed, use the procedures described in Tex-233-F to plot the results of all productions and placement testing. Update the control charts as soon as test results for each subplot become available. Make the control charts readily accessible at the field laboratory. The Engineer may suspend production for failure to update control charts.

- C. Quality Control Plan (QCP).** Develop and follow the QCP in detail. Obtain approval from the Engineer for changes to the QCP made during the project. The Engineer may suspend operations if the Contractor fails to comply with the QCP.

When directed, submit a written QCP to the Engineer before the mandatory pre-paving meeting. Receive the Engineer's approval of the QCP before beginning production. Include the following items in the QCP:

1. **Project Personnel.** For project personnel, include:
 - a list of individuals responsible for QC with authority to take corrective action, and
 - contact information for each individual listed.
2. **Material Delivery and Storage.** For material delivery and storage, include:
 - the sequence of material processing, delivery, and minimum quantities to assure continuous plant operations,
 - aggregate stockpiling procedures to avoid contamination and segregation,
 - frequency, type, and timing of aggregate stockpile testing to assure conformance of material requirements before mixture production, and
 - procedure for monitoring the quality and variability of asphalt binder and the polymer modified emulsion membrane.
3. **Production.** For production, include:
 - loader operation procedures to avoid contamination in cold bins,
 - procedures for calibrating and controlling cold feeds,
 - procedures to eliminate debris or oversized material,
 - procedures for adding and verifying rates of each applicable mixture component (e.g., aggregate, asphalt binder, lime, liquid anti-strip),
 - procedures for reporting job control test results, and
 - procedures to avoid segregation and drain-down in the silo.
4. **Loading and Transporting.** For loading and transporting, include:
 - type and application method for release agents, and
 - truck loading procedures to avoid segregation.
5. **Placement and Compaction.** For placement and compaction, include:
 - proposed agenda for mandatory pre-paving meeting, including date and location
 - type and application method for release agents in the paver and on rollers, shovels, lutes, and other utensils,
 - procedures for the transfer of mixture into the paver while avoiding segregation and preventing material spillage,
 - process to balance production, delivery, paving, and compaction to achieve continuous placement operations,
 - paver operations (e.g., operation of wings, height of mixture in auger chamber) to avoid physical and thermal segregation and other surface irregularities, and
 - procedures to construct quality longitudinal and transverse joints.

D. Mixture Design.

1. **Design Requirements.** Unless otherwise shown on the plans, use Tex-247-F to design a mixture meeting the requirements listed in Tables 1, 6 and 7. Use $N_{des} = 50$ as the design number of gyrations. Design the mixture with an air void structure that will accommodate a membrane application rate in conformance with Table 9.

At any time during the project, the Contractor may submit a new mixture design. The Engineer will approve all mixture designs before the Contractor can begin production. When shown on the plans, the Engineer will provide the mixture design.

Provide the Engineer with a mixture design report using Department-provided software. Include the following items in the report:

- the combined aggregate gradation, source, specific gravity, and percent of each material used,
- results of all applicable tests,
- ignition oven correction factors for asphalt content and gradation,
- the mixing and molding temperatures,
- the signature of the Level II person or persons that performed the design,
- the date the mixture design was performed, and
- a unique identification number for the mixture design.

Table 6
Master Gradation Bands (% Passing by Weight) and Binder Content

Sieve Size		Type A	Type B	Type C
(inch)	(mm)	Gradation	Gradation	Gradation
3/4 in.	19			100*
1/2 in.	12.7		100	75–100
3/8 in.	9.5	100	75–100	55–80
4	4.75	35–55	22–36	22–36
8	2.36	19–30	19–30	19–30
16	1.18	14–25	14–24	14–24
30	0.60	10–18	10–18	10–18
50	0.30	7–14	7–14	7–14
100	0.15	5–10	5–10	5–10
200	0.075	4–6	4–6	4–6
AC Content %		5.0–5.8	4.8–5.6	4.6–5.6

* A target of 100% passing the 5/8 in. is recommended. Mixtures containing 5/8 in. aggregate size may require a greater paving thickness.

Table 7
Laboratory Mixture Design Properties

Mixture Property	Test Method	Minimum	Maximum
Film Thickness, microns	Tex-247-F	9	–
Drain-down, %	Tex-235-F	–	0.1
Cantabro Loss (unaged), %	Tex-245-F	–	20.0 ¹
Boil test	Tex-530-C	Pass/Fail	None
Membrane Application Rate, gal/sy	Tex-247-F	Report	Report
Laboratory-molded density, %	Tex-207-F, Part VI	85 ²	92

1. Test and report for informational purposes only.

2. Suggested limit. Test and report for informational purposes only.

- 2. Job Mix Formula (JMF) Approval.** The JMF is the combined aggregate gradation and target asphalt percentage used to establish target values for hot mix production. JMF1 is the original laboratory mixture design used to produce the trial batch. The Engineer and the Contractor will verify JMF1 based on plant produced mixture from the trial batch unless otherwise approved. The Engineer may accept an existing mixture design previously used on a Department project and may waive the trial batch to verify JMF1.

a. Contractor's Responsibilities.

- (1) **Submitting JMF1.** Furnish the Engineer a mix design report (JMF1) and request approval to produce the trial batch.
- (2) **Membrane Target Application Rate.** Provide the Engineer the emulsion membrane target application rate calculated from JMF1.
- (3) **Supplying Aggregates.** Provide the Engineer with approximately 40 lb. of each aggregate stockpile unless otherwise directed.
- (4) **Supplying Asphalt.** Provide the Engineer at least 1 gal. of the asphalt material and sufficient quantities of any additives proposed for use.
- (5) **Ignition Oven Correction Factors.** Determine the aggregate and asphalt correction factors from the ignition oven using Tex-236-F. Base correction factors from washed sieve analysis as required by the mix design. Provide the Engineer with split samples of the mixtures and blank samples used to determine the correction factors.
- (6) **Boil Test.** Perform the test and retain the tested sample from Tex-530-C. Use this sample for comparison purposes during production. The Engineer may waive the requirement for the boil test. If signs of stripping exist, add lime or commercial anti-stripping agents (liquid anti-strip) as directed.
- (7) **Trial Batch Approval.** Upon receiving conditional approval of JMF1 from the Engineer, provide a plant-produced trial batch for verification testing of JMF1 and development of JMF2.

- (8) **Trial Batch Production Equipment.** To produce the trial batch, use only equipment and materials proposed for use on the project.
- (9) **Trial Batch Quantity.** Produce enough quantity of the trial batch to ensure that the mixture is representative of JMF1.
- (10) **Number of Trial Batches.** Produce trial batches as necessary to obtain a mixture that meets the operational tolerances in Table 8.
- (11) **Trial Batch Sampling.** Obtain a representative sample of the trial batch and split it into three equal portions in accordance with Tex-222-F. Label these portions as “Contractor,” “Engineer,” and “Referee.” Deliver samples to the appropriate laboratory.
- (12) **Trial Batch Testing.** Test the trial batch to ensure the mixture produced using the proposed JMF1 meets the verification testing requirements for gradation, binder content, laboratory-molded density, and drain-down listed in Table 8. Apply correction factors determined in Section 4.D.2.a.(5) to JMF1 results for gradation and asphalt content. Provide the Engineer with a copy of the trial batch test results.
- (13) **Development of JMF2.** After the Engineer grants full approval of JMF1 based on results from the trial batch, evaluate the trial batch test results, determine the optimum mixture proportions, and submit as JMF2.
- (14) **Mixture Production.** After receiving approval for JMF2, use JMF2 to produce Lot 1.
- (15) **Development of JMF3.** Evaluate the test results from Lot 1, determine the optimum mixture proportions, and submit as JMF3 for use in Lot 2.
- (16) **JMF Adjustments.** If necessary, adjust the JMF before beginning a new lot. The adjusted JMF must:
- be provided to the Engineer in writing before the start of a new lot,
 - be numbered in sequence to the previous JMF,
 - meet the master gradation limits shown in Table 8, and
 - be within the operational tolerances of JMF2 listed in Table 8.
- (17) **Requesting Referee Testing.** If needed, use the referee testing in accordance with Section 4.I.1 to resolve testing differences with the Engineer.

Table 8
Testing Frequency and Mixture Production Tolerances

Test Description	Test Method	Minimum Contractor Testing Frequency	Minimum Engineer Testing Frequency	Operational Tolerance from JMF
% Passing for sieve sizes larger than #4	Tex-200-F	1 per subplot	1 per 4 lots	+/-5.0
% Passing #4 and #8	Tex-200-F	1 per subplot	1 per 4 lots	+/-4.0
% Passing #16, #30 and #50	Tex-200-F	1 per subplot	1 per 4 lots	+/-3.0
% Passing #100	Tex-200-F	1 per subplot	1 per 4 lots	+/-2.0
% Passing #200	Tex-200-F	1 per subplot	1 per 4 lots	See Note 1
Binder Content, %	Tex-236-F	1 per subplot	1 per 4 lots	+/-0.3
Rice Gravity	Tex 227-F	1 per lot	1 per 4 lots	See Note 3
Drain-down, %	Tex-235-F	1 per subplot	1 per 4 lots	Table 5
Boil Test ²	Tex-530-C	1 per project	1 per project	N/A
Membrane Application Rate	Tex-247-F	1 per lot	1 per 4 lots	+/-0.02
Asphalt Binder Sampling ²	Tex-500-C	1 per subplot (sample only)	1 per project	N/A
Emulsion Membrane Sampling ²	Tex-500-C	1 per lot (sample only)	1 per project	Table 4
Lab molded density	Tex-207-F Part VI	1 per subplot	1 per 4 lots	Table 7
Thermal profile	Tex-244-F	1 per subplot	Optional	N/A

1. Take corrective action if aggregate gradation exceeds limits shown in Table 8.

2. The Engineer may reduce or waive the sampling and testing requirements based on a satisfactory test history.

3. Used to calculate density.

b. Engineer's Responsibilities.

- (1) **Gyratory Compactor.** For molding trial batch samples, the Engineer will use the Contractor-provided SGC at the Contractor's field laboratory or provide and use a Department SGC at an alternate location.
- (2) **Conditional Approval of JMF1.** Within two working days of receiving the mixture design report (JMF1) and all required materials, the Engineer will review the Contractor's mixture design report and verify conformance with all aggregates, asphalt, additives, and mixture specifications. The Engineer may perform tests to verify the aggregates meet the requirements listed in Table 1. The Engineer will grant the Contractor conditional approval of JMF1 if the information provided on the paper copy of JMF1 indicates the Contractor's mixture design meets the specifications. Full approval of JMF1 will be based on the Engineer's test results on mixture from the trial batch.
- (3) **Authorizing Trial Batch.** After conditionally approving JMF1, the Engineer will authorize the Contractor to produce a trial batch.
- (4) **Ignition Oven Correction Factor.** The Engineer will use the split samples provided by the Contractor to determine the aggregate and asphalt correction factors for the ignition oven in accordance with Tex-236-F.
- (5) **Testing the Trial Batch.** Within one full working day, the Engineer will sample and test the trial batch to ensure that the gradation and binder content meet the requirements listed in Table 8. Apply correction factors

determined in Section 4.D.2.a.(5) to JMF1 results for gradation and asphalt content.

The Engineer will have the option to perform the following tests on the trial batch:

- Tex-235-F to verify that drain-down meets the requirement shown in Table 7.
- Tex-461-A to determine the need for additional magnesium sulfate soundness testing.
- Tex-530-C to retain and use for comparison purposes during production.
- Tex-245-F to verify the Cantabro loss meets the requirement shown in Table 7.

- (6) **Full approval of JMF1.** The Engineer will grant full approval of JMF1 and authorize the Contractor to proceed with developing JMF2 if the Engineer's results for gradation and asphalt content confirm that the trial batch meets the requirements in Table 8.

The Engineer will notify the contractor that an additional trial batch is required if the trial batch does not meet the requirements in Table 8.

- (7) **Approval JMF2.** The Engineer will approve JMF2 within one working day if it meets the master grading limits shown in Table 6 and is within the operational tolerances of JMF1 listed in Table 8.
- (8) **Approval Lot 1 Production.** The Engineer will authorize the Contractor to proceed with Lot 1 production after approving JMF2.
- (9) **Approval of JMF3.** The Engineer will approve JMF3 within 1 working day if it meets the master grading limits shown in Table 6 and is within the operational tolerances of JMF2 listed in Table 8.

2. **JMF Adjustments.** Produce the mixture within the operational tolerances listed in Table 8. The Engineer may suspend production if corrective actions are not taken when operational tolerances are exceeded. With approval from the Engineer, the JMF target values may be adjusted as needed. Document any changes to the JMF with a subsequent JMF number. The Engineer may adjust the target asphalt percentage within the operational tolerances of the JMF.

- E. **Production Operations.** Perform a new trial batch when the plant or plant location is changed. Perform quality control at the frequency and within the tolerances listed in Table 8. Take corrective action and receive approval to proceed after any production suspension for noncompliance to the specification.

At any time during production, the Engineer may require the Contractor to verify the following based on quantities used:

- Additives:
 - lime (within $\pm 0.1\%$ of JMF)
 - liquid anti-strip (within $\pm 0.05\%$ of JMF)
- Emulsion membrane application rate (within ± 0.02 gal/sy of JMF)

If the aggregate mineralogy is such that Tex-236-F does not yield reliable results, the Engineer may allow alternate methods for determining the asphalt content and aggregate gradation. Unless otherwise allowed, the Engineer will require the Contractor to provide evidence that results from Tex-236-F are not reliable before permitting an alternate method. If an alternate test method is allowed, use the applicable test procedure as directed.

1. **Storage and Heating of Materials.** Do not heat the asphalt binder above the temperatures specified in Item 300 or from the manufacturer's recommended values. On a daily basis, provide the Engineer with the records of asphalt binder and hot mix asphalt discharge temperatures in accordance with Section 3.A.1.c. Unless otherwise approved, do not store hot mix for more than 6 hrs. or a period that adversely affects the quality of the mixture.
2. **Mixing and Discharge of Materials.** Notify the Engineer of the target discharge temperature and produce the mixture within 25°F of the target. Monitor the temperature of the material in the truck before shipping to ensure that it does not exceed 350°F. The Department will not pay for or allow placement of any mixture produced at more than 350°F.

Control the mixing time and temperature so that substantially all moisture is removed from the mixture before discharging from the plant. If requested, perform Tex-212-F, Part II, and verify that the mixture contains no more than 0.2% of moisture by weight. Obtain the sample immediately after discharging the mixture into the truck and perform the test promptly.

- F. **Hauling Operations.** Before use, clean all truck beds to ensure mixture is not contaminated. When a release agent is necessary, use a release agent on the approved list maintained by the Construction Division to coat the inside bed of the truck.
- G. **Placement Operations.** Prepare the surface by removing raised pavement markers and objectionable material such as moisture and dirt, sand, leaves, and other loose impediments from the surface before placing mixture. Remove vegetation from pavement edges. Use an approved paver to concurrently apply the membrane and place the UTBHMWC mixture to produce a smooth, finished surface with a uniform appearance and texture that meet typical section requirements. Control the speed of the paver to ensure that the membrane is exposed for no more than 5 seconds before being covered with UTBHMWC. Place mixture so longitudinal joints on the surface course coincide with lane lines, or as directed. When placing the hot mix adjacent to gutters and structures to ensure that the pavement will drain properly.

1. **Weather Conditions.** Place the mixture when the roadway surface temperature is 70°F or higher, unless otherwise approved. Measure the roadway surface temperature with a handheld infrared thermometer. Place mixtures only when general weather conditions and moisture conditions of the roadway surface are suitable in the opinion of the Engineer.
2. **Application of Membrane.** Unless otherwise directed by the Engineer, apply the membrane at the rates shown in mixture design within the limits shown in Table 9. The Engineer may adjust the application rate, taking into consideration the existing pavement surface conditions. Spray the membrane using a metered mechanical pressure spray bar at a temperature of 120°F to 180°F. Monitor the membrane application rate and adjust the rate when needed or when directed. If required, verify that the spray bar is capable of applying the membrane at a uniform rate across the entire paving width as directed. Do not let the wheels or other parts of the paving machine contact the freshly applied membrane.

Table 9
Membrane Application Rate Limits, (gallons per square yard)

Type A	Type B	Type C
0.14 – 0.20	0.16 – 0.24	0.17 – 0.27

3. **Lay-Down Operations.** Measure the temperature of mixture delivered to the paver and take corrective action if needed to ensure the temperature does not drop below 290°F.

For each subplot use a handheld infrared thermometer to obtain a thermal profile of the uncompacted mat immediately behind the paver. Record the information on Department QCQA forms and submit the forms to the Engineer. The Engineer may reduce the testing frequency based on a satisfactory test history.

- a. **Thermal Profile.** For each subplot, obtain a thermal profile using Tex-244-F. The Engineer may also obtain as many thermal profiles as deemed necessary.

No more than a 50°F differential will be allowed along the profile of the uncompacted mat surface immediately behind the paver. Unless otherwise directed, suspend operations and remove and replace material that exceeds the maximum temperature differential of 50°F. Resume operations when the Engineer determines that subsequent production will meet the specifications.

If the temperature differential is between 25°F and 50°F, the area will be deemed as having thermal segregation. Take corrective action to eliminate areas that have thermal segregation.

- H. **Compaction.** Roll the freshly placed UTBHMWC with a steel-wheeled roller, operated in static mode, to seat the mixture without excessive breakage of the aggregate and to provide a smooth surface and uniform texture. Compact the wearing course a minimum of two passes and a maximum of three passes. Do not use pneumatic rollers. Thoroughly moisten the roller drums with a soap and water solution to prevent adhesion. Unless otherwise directed, use only water or a Department-approved release agent on rollers, tamps, and other compaction equipment.

The Engineer may use, or require the Contractor to use, Tex-246-F to test and verify that the compacted mixture has adequate permeability. Adjust the mixture design or construction methods if the compacted mixture does not exhibit adequate permeability.

Allow the compacted pavement to cool to 160°F or lower before opening to traffic unless otherwise directed.

- I. Acceptance Plan.** Sample and test the hot mix on a lot and subplot basis. A production lot consists of four equal sublots. Lot 1 will be 500 tons or one day's production. The Engineer will select subsequent lot sizes based on the anticipated daily production. The lot size will be at least 500 tons, but no greater than 2000 tons. The Engineer may change the lot size before the Contractor begins any lot. If the production or placement test results are not within the acceptable tolerances listed in Table 8, suspend production until test results or other information indicate, to the satisfaction of the Engineer, that the next material produced or placed will meet the specified values.

- 1. Referee Testing.** The Construction Division is the referee laboratory. The Contractor may request referee testing if the differences between Contractor and Engineer test results exceed the operational tolerances shown in Table 8 and the differences cannot be resolved. Make the request within five working days after receiving test results from the Engineer. Referee tests will be performed only on the lot in question and only for the particular test in question. Allow ten working days from the time the samples are received at the referee laboratory for test results to be reported. The Department may require the Contractor to pay for additional referee tests if more than three referee tests per project are required and the Engineer's test results are closer to the referee test results than the Contractor's test results.

2. Production Acceptance.

- a. Mixture Sampling.** For each subplot, take one sample at the location randomly selected. For each lot, the Engineer will randomly select and test a "blind" sample from at least one subplot. The location of the Engineer's "blind" sample will not be disclosed to the Contractor. The Engineer will use the Contractor's split sample for sublots not sampled by the Engineer.

The sampler will split each sample into three equal portions in accordance with Tex-200-F and label these portions as "Contractor," "Engineer," and "Referee." Deliver the samples to the appropriate party's laboratory. Deliver referee samples to the Engineer. Discard unused samples after accepting pay adjustment factors for that lot.

- b. Asphalt Binder Sampling.** Obtain a 1-qt. sample of the asphalt binder for each lot of mixture produced. Obtain the sample at approximately the same time the mixture random sample is obtained. Supply a sampling port between any additive blending device and mixer. Locate the sampling port downstream of any additive addition so the sample will be a representation of the final asphalt-additive blend going to the roadway. Sample from a port located immediately upstream from the mixing drum or pug mill. Take the sample in accordance with Tex-500-C, Part II. Label the can with the corresponding lot and subplot numbers, and deliver the sample to the Engineer.

The Engineer may also obtain independent samples. If the Engineer chooses to obtain an independent asphalt binder sample, the Engineer will split a sample of the asphalt binder with the Contractor. The Engineer will test at least one asphalt binder sample per project to verify compliance with Item 300.

- c. **Operational Tolerances.** Control the production process within the operational tolerances listed in Table 8. When production is suspended, the Engineer will allow production to resume when test results or other information indicates the next mixture produced will be within the operational tolerances.

3. Placement Acceptance.

- a. **Emulsion Membrane Sampling.** Obtain a 1-qt. sample of the polymer-modified emulsion for each subplot of mixture produced. Take the sample from the emulsion tank located on the paving machine, but not from the emulsion spraybar. Obtain the sample at approximately the same time the mixture random sample is obtained. Take the sample in accordance with Tex-500-C, Part III. Label the can with the corresponding lot and subplot numbers, and deliver the sample to the Engineer.
- b. **Recovered Asphalt DSR.** The Engineer may take production samples or cores from suspect areas of the project to determine recovered asphalt properties. Asphalt binders with an aging ratio greater than 3.5 do not meet the requirements for recovered asphalt properties and may be deemed defective when tested and evaluated by the Construction Division. The aging ratio is the dynamic shear rheometer (DSR) value of the extracted binder divided by the DSR value of the original unaged binder. DSR values are obtained according to AASHTO T315 at the specified high temperature performance grade of the asphalt. The Engineer may require removal and replacement of the defective material at the Contractor's expense. The asphalt binder will be recovered for testing from production samples or cores using Tex-211-F.
- c. **Irregularities.** Immediately take appropriate corrective actions if surface irregularities, including but not limited to segregation, rutting, raveling, flushing, fat spots, mat slippage, color, texture, roller marks, tears, gouges, streaks, or uncoated aggregate particles are detected. The Engineer may allow placement to continue for at most one day of production while taking appropriate action. If the problem still exists after that day, suspend paving until the problem is corrected to the satisfaction of the Engineer.

At the expense of the Contractor and to the satisfaction of the Engineer, remove and replace any mixture that does not bond to the existing pavement or has other surface irregularities identified above.

- 4. **Ride Quality.** Unless otherwise shown in the plan, measure ride quality in accordance with Item 585.

- 5. **Measurement.** Ultra Thin-Bonded Hot Mix Wearing Course (UTBHMWC) will be measured by the ton of UTBHMWC. UTBHMWC is defined as the asphalt, aggregate, and

additives. The weights of asphalt and aggregate will be calculated based on the measured weight of UTBHMWC and the target percentage of asphalt and aggregate. Measure the weight on scales in accordance with Item 320. Measure the UTBHMWC polymer modified emulsion membrane by the gallon or the ton, in accordance with the bid item specified.

A. Membrane. Unless otherwise noted on the plans, membrane material will be measured by one of the following methods:

1. Volume. Membrane material will be measured at the applied temperature by strapping the tank before and after road application and determining the net volume in gallons from the distributor's calibrated strap stick. The quantity to be measured for pavement will be the number of gallons used corrected to 60°F, as directed, in the accepted surface treatment.

2. Weight. Membrane material will be measured in tons using certified scales meeting the requirements of Item 320, unless otherwise approved. The transporting truck must have a seal attached to the driving device and other openings. The Engineer may require random checking on public scales, at the Contractor's expense, to verify weight accuracy.

Upon work completion or temporary suspension, any remaining membrane material will be weighed by a certified public weigher or measured by volume in a calibrated distributor or tank, and the quantity converted to tons at the measured temperature. The quantity to be measured will be the number of tons received, minus the number of tons remaining after all directed work is complete, and minus the amount used for other items.

B. Asphalt. The asphalt weight in tons will be determined from the total weight of UTBHMWC. Measured asphalt percentage will be obtained using Tex-236-F or asphalt flow meter readings, as determined by the Engineer.

1. Target Percentage. The JMF target asphalt percentage will be used to calculate the weight of asphalt binder unless the measured asphalt binder percentage is more than 0.3 percentage points below the JMF target asphalt percentage. Volumetric meter readings will be adjusted to 60°F and converted to weight.

2. Measured Percentage. The measured asphalt percentage will be used for payment for that lot's production when the measured percentage is more than 0.3 percentage points below the JMF target asphalt percentage.

C. Aggregate. The aggregate weight in tons will be determined from the total weight of UTBHMWC less the weight of the asphalt.

6. Payment. The work performed and materials furnished in accordance with this Item and measured as provided under Section 4.I.5 will be paid for at the unit price bid for "UTBHMWC (Membrane)," for "UTBHMWC (Asphalt)," and for "UTBHMWC (Aggregate)" of the types specified. These prices are full compensation for all materials, equipment, labor, tools, and incidentals.

Trial batches will not be paid for unless they are included in pavement work approved by the Department.

SPECIAL SPECIFICATION**3283****Thin Surface Mixtures (TSM)**

1. **Description.** Construct a thin surface course composed of a compacted mixture of aggregate and asphalt binder mixed hot in a mixing plant. Produce a thin surface course with a minimum lift thickness of ½ inch for the Ultra-Thin (UT) mixture and ¾ inch for the Thin Overlay Mixture (TOM).
2. **Materials.** Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications.

Notify the Engineer of all material sources. Notify the Engineer before changing any material source or formulation. When the Contractor makes a source or formulation change, the Engineer will verify that the specification requirements are met and may require a new laboratory mixture design, trial batch, or both. The Engineer may sample and test project materials at any time during the project to verify specification compliance in accordance with Item 6, “Control of Materials.”

A. Aggregate. Furnish aggregates from sources that conform to the requirements shown in Table 1 and as specified in this Section. Additional aggregate requirements may be specified when shown on the plans. Provide aggregate stockpiles that meet the definition in this Section for coarse, intermediate, or fine aggregate. Do not use reclaimed asphalt pavement (RAP) or recycled asphalt shingles (RAS). Supply aggregates that meet the definitions in Tex-100-E for crushed gravel or crushed stone. The Engineer will designate the plant or the quarry as the sampling location. Samples must be from materials produced for the project. The Engineer will establish the surface aggregate classification (SAC) and perform Los Angeles abrasion, magnesium sulfate soundness, and Micro-Deval tests. Perform all other aggregate quality tests listed in Table 1. Document all test results on the mixture design report. The Engineer may perform tests on independent or split samples to verify Contractor test results. Stockpile aggregates for each source and type separately. Determine aggregate gradations for mixture design and production testing based on the washed sieve analysis given in Tex-200-F, Part II.

1. **Coarse Aggregate.** Coarse aggregate stockpiles must have no more than 20% material passing the No. 8 sieve. Aggregate from sources listed in the Department’s *Bituminous Rated Source Quality Catalog* (BRSQC) located at <http://www.txdot.gov/business/resources/producer-list.html> are preapproved for use.

For sources not listed on the Department’s BRSQC:

- build an individual stockpile for each material;
- request the Department test the stockpile for specification compliance; and
- once approved, do not add material to the stockpile unless otherwise approved.

Use only the rated values for hot mix listed in the BRSQC. Rated values for surface treatment (ST) do not apply to coarse aggregate sources used in hot mix asphalt. Provide aggregate from non-listed sources only when tested by the Engineer and approved before use. Allow 30 calendar days for the Engineer to sample, test, and report results for non-listed sources.

- a. **Blending Class A and Class B Aggregates.** Class B aggregate meeting all other requirements in Table 1 may be blended with a Class A aggregate in order to meet requirements for Class A materials. When blending Class A and B aggregates to meet a Class A requirement, ensure that at least 50% by weight of material retained on the No. 8 sieve comes from the Class A aggregate source. Blend by volume if the bulk specific gravities of the Class A and B aggregates differ by more than 0.300.

When the Contractor blends Class A and B aggregates to meet a Class A requirement, the Engineer may perform tests at any time during production to ensure that at least 50% by weight of the material retained on the No. 8 sieve comes from the Class A aggregate source. In such cases where the Engineer elects to verify conformance, the Engineer will use the Department's mix design Excel template to calculate the percent of Class A aggregate retained on the No. 8 sieve by inputting the bin percentages shown from readouts in the control room at the time of production and stockpile gradations measured at the time of production. The Engineer may determine the gradations based on either washed or dry sieve analysis from samples obtained from individual aggregate cold feed bins or aggregate stockpiles. The Engineer may perform spot checks using the gradations supplied by the Contractor on the mixture design report as an input for the Excel template; however, a failing spot check will require confirmation with a stockpile gradation determined by the Engineer.

- b. **Micro-Deval Abrasion.** The Engineer will perform a minimum of one Micro-Deval abrasion test in accordance with Tex-461-A for each coarse aggregate source used in the mixture design that has a Rated Source Soundness Magnesium (RSSM) loss value greater than 15 as listed in the BRSQC. The Engineer will perform testing prior to the start of production and may perform additional testing at any time during production. The Engineer may obtain the coarse aggregate samples from each coarse aggregate source or may require the Contractor to obtain the samples. The Engineer may elect to waive all Micro-Deval testing based on a satisfactory test history of the same aggregate source.

When tested, the Engineer will estimate the magnesium sulfate soundness loss for each coarse aggregate source using the following formula:

$$Mg_{est.} = (RSSM)(MD_{act.}/RSMD)$$

where:

Mg_{est} = magnesium sulfate soundness loss

MD_{act} = actual Micro-Deval percent loss

RSMD = Rated Source Micro-Deval

When the estimated magnesium sulfate soundness loss is greater than the maximum magnesium sulfate soundness loss specified, the coarse aggregate source will not be allowed for use unless otherwise approved by the Engineer. The Engineer will consult the Geotechnical, Soils, and Aggregates Branch of the Construction Division, and additional testing may be required prior to granting approval.

2. **Intermediate Aggregate.** Aggregates not meeting the definition of coarse or fine aggregate will be defined as intermediate aggregate. When used, supply intermediate aggregates that are free from organic impurities. The Engineer may test the intermediate aggregate in accordance with Tex-408-A to verify the material is free from organic impurities. When used, supply intermediate aggregate from coarse aggregate sources that meet the requirements shown in Table 1 unless otherwise approved.

If 10% or more of the stockpile is retained on the No. 4 sieve, test the stockpile and verify that it meets the requirements in Table 1 for coarse aggregate angularity (Tex-460-A) and flat and elongated particles (Tex-280-F).

3. **Fine Aggregate.** Fine aggregates consist of manufactured sands and screenings. Natural sands are not allowed in any mixture. Fine aggregate stockpiles must meet the gradation requirements in Table 2. Supply fine aggregates that are free from organic impurities. The Engineer may test the fine aggregate in accordance with Tex-408-A to verify that the material is free from organic impurities. Use fine aggregate from coarse aggregate sources that meet the requirements in Table 1, unless otherwise approved.

If 10% or more of the stockpile is retained on the No. 4 sieve, test the stockpile and verify that it meets the requirements in Table 1 for coarse aggregate angularity (Tex-460-A) and flat and elongated particles (Tex-280-F).

Table 1
Aggregate Quality Requirements

Property	Test Method	Requirement
Coarse Aggregate		
SAC	AQMP	A ¹
Deleterious material, %, max	Tex-217-F, Part I	1.5
Decantation, %, max	Tex-217-F, Part II	1.5
Micro-Deval abrasion, %, max	Tex-461-A	Note 2
Los Angeles abrasion, %, max	Tex-410-A	30
Magnesium sulfate soundness, 5 cycles, %, max	Tex-411-A	20
Coarse aggregate angularity, 2 crushed faces, %, min ³	Tex 460-A, Part I	100 ⁴
Flat and elongated particles @ 5:1, %, max	Tex-280-F	10
Fine Aggregate		
Linear shrinkage, %, max	Tex-107-E	3
Combined Aggregate⁴		
Sand equivalent, %, min	Tex-203-F	45

1. Surface aggregate classification of "A" is required unless otherwise shown on plans.

2. Used to estimate the magnesium sulfate soundness loss in accordance with Section 347.2.A.1, "Coarse Aggregate."

3. Only applies to crushed gravel.

4. Aggregates, without mineral filler, or additives, combined as used in the job-mix formula (JMF).

Table 2
Gradation Requirements for Fine Aggregate

Sieve Size	% Passing by Weight or Volume
$\frac{3}{8}$ "	100
#8	70 – 100
#200	0 – 30

B. Mineral Filler. Mineral filler consists of finely divided mineral matter such as agricultural lime, crusher fines, hydrated lime, or fly ash. Mineral filler is allowed unless otherwise shown on the plans. Do not use more than 2% mineral hydrated lime unless otherwise shown on the plans. Test all mineral fillers except hydrated lime and fly ash in accordance with Tex-107-E to ensure specification compliance. The plans may allow or disallow specific mineral fillers. When used, provide mineral filler that:

- is sufficiently dry, free-flowing and free from clumping and foreign matter;
- does not exceed 3% linear shrinkage when tested in accordance with Tex-107-E; and
- meets the gradation requirements in Table 3

Table 3
Gradation Requirements for Mineral Filler

Sieve Size	% Passing by Weight or Volume
#8	100
#200	55–100

- C. **Baghouse Fines.** Fines collected by the baghouse or other dust-collecting equipment may be reintroduced into the mixing drum.
- D. **Asphalt Binder.** Furnish performance-graded (PG) asphalt binder with a high temperature grade of PG 76 or 70 and a low temperature grade as shown on the plans, in accordance with Section 300.2.J, "Performance-Graded Binders".
- E. **Tack Coat.** Furnish CSS-1H, SS-1H, or a PG binder with a minimum high-temperature grade of PG 58 for the tack coat binders unless otherwise shown on the plans, in accordance with Item 300, "Asphalts, Oils, and Emulsions." Do not dilute emulsion asphalts at the terminal, in the field, or at any other location before use.

The Engineer will obtain at least one sample of the tack coat binder per project and test it to verify compliance with Item 300. The Engineer will obtain the sample from the asphalt distributor immediately before use.

- F. **Additives.** Use the type and rate of additive when shown on the plans. Other additives that facilitate mixing, compaction, or improve the quality of the mixture may be allowed when approved. Provide the Engineer with documentation such as the bill of lading showing the quantity of additives used in the project unless otherwise directed.
 - 1. **Lime and Liquid Antistripping Agent.** When lime or a liquid antistripping agent is used, add in accordance with Item 301, "Asphalt Antistripping Agents." Do not use more than 1% hydrated lime when using crushed gravel. Do not add lime directly into the mixing drum of any plant where lime is removed through the exhaust stream unless the plant has a baghouse or dust collection system that reintroduces the lime into the drum.
 - 2. **Warm Mix Asphalt (WMA).** Warm Mix Asphalt (WMA) is defined as HMA that is produced within a target temperature discharge range of 215°F and 275°F using Department-approved WMA additives or processes. The Department's Material Producer List of WMA additives and processes is located at <http://www.txdot.gov/business/resources/producer-list.html>.

WMA is allowed for use on all projects and is required when shown on plans. The maximum placement or target discharge temperature for WMA may be set at a value less than 275°F when shown on the plans.

Department-approved WMA additives or processes may be used to facilitate mixing and compaction of HMA produced at target discharge temperatures greater than 275°F; however, such mixtures will not be defined as WMA.

- G. **Recycled Materials.** Recycled materials are not allowed for use.

- 3. **Equipment.** Provide required or necessary equipment in accordance with Item 320, "Equipment for Hot-Mix Asphalt Materials."
- 4. **Construction.** Produce, haul, place, and compact the specified paving mixture. In addition to tests required by the specification, Contractors may perform other QC tests as deemed necessary.

At any time during the project, the Engineer may perform production and placement tests as deemed necessary in accordance with Item 5, "Control of the Work." On or before the first day of paving, it is mandatory to schedule and participate in a pre-paving meeting with the Engineer unless otherwise shown on the plans

- A. Certification.** Personnel certified by the Department-approved hot-mix asphalt certification program must conduct all mixture designs, sampling, and testing in accordance with Table 4. Supply the Engineer with a list of certified personnel and copies of their current certificates before beginning production and when personnel changes are made. Provide a mixture design developed and signed by a Level II certified specialist. Provide a Level IA certified specialist at the plant during production operations. Provide a Level IB certified specialist to conduct placement tests.

Table 4
Test Methods, Test Responsibility, and Minimum Certification Levels

Test Description	Test Method	Contractor	Engineer	Level ¹
1. Aggregate Testing				
Sampling	Tex-400-A	✓	✓	1A
Dry sieve	Tex-200-F, Part I	✓	✓	1A
Washed sieve	Tex-200-F, Part II	✓	✓	1A
Deleterious material	Tex-217-F, Part I	✓	✓	2
Decantation	Tex-217-F, Part II	✓	✓	2
Los Angeles abrasion	Tex-410-A		✓	TxDOT
Magnesium sulfate soundness	Tex-411-A		✓	TxDOT
Micro-Deval abrasion	Tex-461-A		✓	2
Coarse aggregate angularity	Tex-460-A	✓	✓	2
Flat and elongated particles	Tex-280-F	✓	✓	2
Linear shrinkage	Tex-107-E	✓	✓	2
Sand equivalent	Tex-203-F	✓	✓	2
Organic impurities	Tex-408-A	✓	✓	2
2. Asphalt Binder & Tack Coat Sampling				
Asphalt binder sampling	Tex-500-C, Part II	✓	✓	1A/1B
Tack coat sampling	Tex-500-C, Part III	✓	✓	1A/1B
3. Mix Design & Verification				
Design and JMF changes	Tex-204-F	✓	✓	2
Mixing	Tex-205-F	✓	✓	2
Molding (TGC)	Tex-206-F	✓	✓	1A
Molding (SGC)	Tex-241-F	✓	✓	1A
Laboratory-molded density	Tex-207-F	✓	✓	1A
VMA ² (calculation only)	Tex-204-F	✓	✓	2
Rice gravity	Tex-227-F	✓	✓	1A
Drain-down	Tex-235-F	✓	✓	1A
Ignition oven calibration ³	Tex-236-F	✓	✓	2
Indirect tensile strength	Tex-226-F	✓	✓	2
Overlay Test	Tex-248-F		✓	TxDOT
Hamburg Wheel test	Tex-242-F	✓	✓	2
Boil test	Tex-530-C	✓	✓	1A
4. Production Testing				
Selecting random production numbers	Tex-225-F, Part I		✓	1A
Mixture sampling	Tex-222-F	✓	✓	1A
Molding (TGC)	Tex-206-F	✓	✓	1A
Molding (SGC)	Tex-241-F	✓	✓	1A
Laboratory-molded density	Tex-207-F	✓	✓	1A
VMA ² (calculation only)	Tex-207-F	✓	✓	1A
Rice gravity	Tex-227-F	✓	✓	1A
Gradation & asphalt binder content ³	Tex-236-F	✓	✓	1A
Drain-down	Tex-235-F	✓	✓	1A
Control charts	Tex-233-F	✓	✓	1A
Moisture content	Tex-212-F	✓	✓	1A
Hamburg Wheel Test	Tex-242-F	✓	✓	2
Overlay Test	Tex-248-F	✓	✓	TxDOT
Micro-Deval abrasion	Tex-461-A		✓	2
Boil Test	Tex-530-C	✓	✓	1A
Aging Ratio	Tex-211-F		✓	TxDOT
5. Placement Testing				
Establish rolling pattern	Tex-207-F	✓		1B
Control charts	Tex-233-F	✓	✓	1A
Ride quality measurement	Tex-1001-S	✓	✓	Note 4
Thermal profile	Tex-244-F	✓	✓	1B
Water Flow	Tex-246-F	✓	✓	1B

1. Level 1A, 1B, and 2 are certification levels provided by the Hot Mix Asphalt Center Certification Program.

2. Voids in Mineral Aggregates.

3. Refer to Section 347.4.I.2.c for exception to using an ignition oven.

4. Profiler and operator are required to be certified at the Texas Transportation Institute facility when Surface Test Type B is specified.

A. Reporting. Use Department-provided Excel templates to record and calculate all test data including but not limited to mixture design, production and placement test results, control charts, thermal profiles, and longitudinal joint density. Obtain the latest version of the Excel templates at <http://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/forms/site-manager.html> or from the Engineer. The Engineer and the Contractor will provide any available test results to the other party when requested. The maximum allowable time for the Contractor and Engineer to exchange test data is as given in Table 5 unless otherwise approved. The Engineer and the Contractor will immediately report to the other party any test result that requires suspension of production or placement, a payment penalty, or that fails to meet the specification requirements. Record and submit all test results and pertinent information on Department-provided Excel templates to the Engineer electronically by means of a portable USB flash drive, compact disc, or via email.

Subsequent sublots placed after test results are available to the Contractor, which require them to suspend operations, may be considered unauthorized work. Unauthorized work will be accepted or rejected at the discretion of the Engineer in accordance with Item 5.3, "Conformity with Plans, Specifications, and Special Provisions."

Table 5
Reporting Schedule

Description	Reported By	Reported To	To Be Reported Within
<i>Production Quality Control</i>			
Gradation ¹ Asphalt binder content ¹ Laboratory-molded density ² Moisture content ³ Boil test ³	Contractor	Engineer	1 working day of completion of the subplot
<i>Production Quality Assurance</i>			
Gradation ³ Asphalt binder content ³ Laboratory-molded density ¹ Hamburg wheel test ² Overlay test ² Boil test ² Binder tests ²	Engineer	Contractor	1 working day of completion of the subplot
<i>Placement Quality Control</i>			
Thermal profile ¹ Water Flow ¹	Contractor	Engineer	1 working day of completion of the lot
<i>Placement Quality Assurance</i>			
Thermal profile ¹ Aging ratio ² Water Flow	Engineer	Contractor	1 working day of completion of the lot

1. These tests are required on every subplot.

2. Optional test. To be reported as soon as results become available.

3. To be performed at the frequency specified on the plans.

Use the procedures described in Tex-233-F to plot the results of all quality control (QC) and quality assurance (QA) testing.

Update the control charts as soon as test results for each subplot become available. Make the control charts readily accessible at the field laboratory. The Engineer may suspend production for failure to update control charts.

- B. QCP.** Develop and follow the QCP in detail. Obtain approval from the Engineer for changes to the QCP made during the project. The Engineer may suspend operations if the Contractor fails to comply with the QCP.

Submit a written QCP to the Engineer before the mandatory prepaving meeting. Receive the Engineer's approval of the QCP before beginning production. Include the following items in the QCP:

- 1. Project Personnel.** For project personnel, include:
 - a list of individuals responsible for QC with authority to take corrective action;
 - contact information for each individual listed; and
 - Copies of certification documents for individuals performing specified QC functions.
- 2. Material Delivery and Storage.** For material delivery and storage, include:
 - the sequence of material processing, delivery, and minimum quantities to assure continuous plant operations;
 - aggregate stockpiling procedures to avoid contamination and segregation;
 - frequency, type, and timing of aggregate stockpile testing to assure conformance of material requirements before mixture production; and
 - procedure for monitoring the quality and variability of asphalt binder.
- 3. Production.** For production, include:
 - loader operation procedures to avoid contamination in cold bins;
 - procedures for calibrating and controlling cold feeds;
 - procedures to eliminate debris or oversized material;
 - procedures for adding and verifying rates of each applicable mixture component (e.g., aggregate, asphalt binder, lime, liquid antistrip);
 - procedures for reporting job control test results; and
 - procedures to avoid segregation and drain-down in the silo.
- 4. Loading and Transporting.** For loading and transporting, include:
 - type and application method for release agents; and
 - truck loading procedures to avoid segregation.
- 5. Placement and Compaction.** For placement and compaction, include:
 - proposed agenda for mandatory prepaving meeting, including date and location;
 - proposed paving plan (e.g., paving widths and lift thicknesses);

- type and application method for release agents in the paver and on rollers, shovels, lutes, and other utensils;
- procedures for the transfer of mixture into the paver, while avoiding segregation and preventing material spillage;
- process to balance production, delivery, paving, and compaction to achieve continuous placement operations and good ride quality;
- paver operations (e.g., operation of wings, height of mixture in auger chamber) to avoid physical and thermal segregation and other surface irregularities; and
- procedures to construct quality longitudinal and transverse joints.

C. Mixture Design.

1. **Design Requirements.** The Contractor may elect to design the mixture using a Texas Gyratory Compactor (TGC) or a Superpave Gyratory Compactor (SGC) unless otherwise shown on the plans. Use the typical weight design example given in Tex-204-F, Part I, when using a TGC. Use the Superpave mixture design procedure given in Tex-204-F, Part IV, when using a SGC. Design a mixture meeting the requirements listed in Tables 1, 2, 3, 5, and 6.

- **Target Laboratory Molded Density When The TGC Is Used.** Design the mixture at a 97.5% target laboratory-molded density or as noted in Table 7.
- **Design Number of Gyration (N_{design}) When The SGC Is Used.** Design the mixture at 50 gyrations (N_{design}). Use a target laboratory-molded density of 96.0% to design the mixture; however, adjustments can be made to the N_{design} value as noted in Table 7. The N_{design} level may be reduced to no less than 35 gyrations at the Contractor's discretion.

Use an approved laboratory to perform the Hamburg Wheel test and the Department perform the Overlay test and provide results with the mixture design, or provide the laboratory mixture and request that the Department perform the Hamburg Wheel test and Overlay test. The Department maintains the Material Producer List of approved laboratories located at <http://www.txdot.gov/business/resources/producer-list.html>. The Engineer will be allowed 10 working days to provide the Contractor with Hamburg Wheel test and Overlay test results on the laboratory mixture design.

The Engineer will provide the mixture design when shown on the plans. The Contractor may submit a new mixture design at any time during the project. The Engineer will approve all mixture designs (JMF1) before the Contractor can begin production.

Provide the Engineer with a mixture design report using Department-provided Excel template. Include the following items in the report:

- the combined aggregate gradation, source, specific gravity, and percent of each material used;

- the target laboratory-molded density (or Ndesign level when using the SGC);
- results of all applicable tests;
- the mixing and molding temperatures;
- the signature of the Level 2 person or persons that performed the design;
- the date the mixture design was performed; and
- a unique identification number for the mixture design.

Table 6
Master Gradation Limits (% Passing by Weight or Volume) and Volumetric Requirements

Sieve Size	Percent Passing	
	TOM	UT
1/2"	100.0 ¹	100.0 ¹
3/8"	95.0 – 100.0	98.0 – 100.0
#4	40.0 – 60.0	70.0 – 95.0
#8	17.0 – 27.0	40.0 – 65.0
#16	5.0 – 27.0	20.0 – 45.0
#30	5.0 – 27.0	10.0 – 35.0
#50	5.0 – 27.0	10.0 – 20.0
#200	5.0 – 9.0	2.0 – 12.0
Property	Requirement	
Binder Content, % Minimum ²	6.0	6.5
Design VMA ³ , % Minimum	16.0	16.5
Plant-Produced VMA ³ , % Minimum	15.5	16.0

1. Defined as maximum sieve size. No tolerance allowed.

2. Unless otherwise shown on the plans or approved by the Engineer.

3. Voids in Mineral Aggregates (VMA)

Table 7
Laboratory Mixture Design Properties

Property	Test Method	Requirement
Target Laboratory-Molded Density, % (TGC)	Tex 207 F	97.5 ¹
Design gyrations (Ndesign for SGC)	Tex-241-F	50 ²
Hamburg Wheel Test, Minimum # of passes @ 12.5 mm Rut Depth for PG 70 mixtures	Tex-242-F	15,000
Hamburg Wheel Test, Minimum # of passes @ 12.5 mm Rut Depth for PG 76 mixtures	Tex-242-F	20,000
Tensile Strength (dry), psi.	Tex-226-F	85-200
Overlay Test, Minimum number of cycles	Tex-248-F	300
Drain-down, Maximum %	Tex-235 - F	0.20

1. Unless otherwise shown on the plans or approved by the Engineer.

2. May be adjusted within the range of 35-100 gyrations when shown on the plans or specification or when mutually agree between the Engineer and Contractor.

- 2. Job-Mix Formula Approval.** The job-mix formula (JMF) is the combined aggregate gradation, target laboratory molded density (or Ndesign level), and target asphalt percentage used to establish target values for hot mix production. JMF1 is the original laboratory mixture design used to produce the trial batch. When WMA is used, JMF1 may be designed and submitted to the Engineer without including the WMA additive.

When WMA is used, document the additive or process used and recommend rate on the JMF1 submittal. The Engineer and the Contractor will verify JMF1 based on a plant-produced mixture from the trial batch unless otherwise approved. The Engineer may accept an existing mixture design previously used on a Department project and may waive the trial batch to verify JMF1. The Department may require the Contractor to reimburse the Department for verification tests if more than two trial batches per design are required.

- **Contractor's Responsibilities.**

- (1) **Providing Gyratory Compactor.** Use a TGC calibrated in accordance with Tex-914-F when electing or required to design the mixture in accordance with Tex-204-F, Part I, for molding production samples. Furnish a SGC calibrated in accordance with Tex-241-F when electing or required to design the mixture in accordance with Tex-204-F, Part IV, for molding production samples. If the SGC is used, locate the SGC at the Engineer's field laboratory and make the SGC available to the Engineer for use in molding production samples.
- (2) **Gyratory Compactor Correlation Factors.** Use Tex-206-F, Part II, to perform a gyratory compactor correlation when the Engineer uses a different gyratory compactor. Apply the correlation factor to all subsequent production test results.
- (3) **Submitting JMF1.** Furnish the Engineer a mix design report (JMF1) with representative samples of all component materials and request approval to produce the trial batch. If opting to have the Department perform Hamburg Wheel test on the laboratory mixture, provide the Engineer with approximately 25 lb. of the design mixture and request that the Department perform the Hamburg Wheel test. Provide the Engineer with approximately 60 lb. of the design mixture to perform the Overlay test.
- (4) **Supplying Aggregate.** Provide the Engineer with approximately 40 lb. of each aggregate stockpile, unless otherwise directed.
- (5) **Supplying Asphalt.** Provide the Engineer at least 1 gal. of the asphalt material and sufficient quantities of any additives proposed for use.
- (6) **Ignition Oven Correction Factors.** Determine the aggregate and asphalt correction factors from the ignition oven in accordance with Tex-236-F. Prior to the trial batch production, provide the Engineer with split samples of the mixtures, including all additives (except water), and blank samples used to determine the correction factors for the ignition oven used for quality assurance testing during production. Correction factors established from a previously approved mixture design may be used for the current mixture design, if the mixture design and ignition oven are the same as previously used, unless otherwise directed.

(7) **Boil Test.** Perform the test and retain the tested sample from Tex-530-C until completion of the project or as directed by the Engineer. Use this sample for comparison purposes during production. The Engineer may waive the requirement for the boil test.

(8) **Trial Batch Production.** Upon receiving conditional approval of JMF1 and authorization from the Engineer to produce a trial batch, provide a plant-produced trial batch, including the WMA additive or process, if applicable, for verification testing of JMF1 and development of JMF2. Produce a trial batch mixture that meets the requirements in Table 8. In lieu of a new trial batch, the Engineer may accept test results from recent production of the same mixture.

Obtain and provide the Engineer with approximately 60 lb. of trial batch mixture in a sealed container, box, or bags labeled with the CSJ number, mixture type, and date for the Overlay test.

(9) **Trial Batch Production Equipment.** To produce the trial batch, use only equipment and materials proposed for use on the project.

(10) **Trial Batch Quantity.** Produce enough quantity of the trial batch to ensure that the mixture meets the specification requirements.

(11) **Number of Trial Batches.** Produce trial batches as necessary to obtain a mixture that meets the specification requirements.

(12) **Trial Batch Sampling.** Obtain a representative sample of the trial batch and split it into three equal portions, in accordance with Tex-222-F. Label these portions as “Contractor,” “Engineer,” and “Referee.” Deliver samples to the appropriate laboratory as directed.

(13) **Trial Batch Testing.** Test the trial batch to ensure that the mixture produced using the proposed JMF1 meets the mixture requirements in Table 6. The trial batch must also comply with the Hamburg Wheel test, Overlay test, and drain-down requirements listed in Table 7.

Use an approved laboratory to perform the Hamburg Wheel test on the trial batch mixture or request that the Department perform the Hamburg Wheel test. Obtain and provide the Engineer with approximately 60 lb. of trial batch mixture in sealed containers, boxes, or bags labeled with the CSJ, mixture type, lot, and subplot number for the Overlay test. The Engineer will be allowed 10 working days to provide the Contractor with Hamburg Wheel test and Overlay test results on the trial batch. Provide the Engineer with a copy of the trial batch test results.

(14) **Development of JMF2.** After the Engineer grants full approval of JMF1 based on results from the trial batch, evaluate the trial batch test results, determine the optimum mixture proportions, and submit as JMF2. Adjust the asphalt content or gradation to achieve the specified target laboratory-molded density.

The asphalt content established for JMF2 is not required to be within any tolerance of the optimum asphalt content established for JMF1; however, mixture produced using JMF2 must meet the voids in the mineral aggregate (VMA) requirements for production shown in Table 6. If the optimum asphalt content for JMF2 is more than 0.5% lower than the optimum asphalt content for JMF1, the Engineer may perform or require the contractor to perform Tex-226-F on Lot 1 production to confirm the indirect tensile strength does not exceed 200 psi and the Overlay test exceeds 300 cycles. Verify that JMF2 meets the mixture requirements in Table 7.

(15) Mixture Production. After receiving approval for JMF2 and receiving a passing result from the Department's or a Department-approved laboratory's Hamburg Wheel test and the Department's Overlay test on the trial batch, use JMF2 to produce Lot 1. As an option, once JMF2 is approved, proceed to Lot 1 production at the Contractor's risk without receiving the results from either the Department's Hamburg Wheel test or Overlay test on the trial batch.

If electing to proceed without the Hamburg Wheel test and Overlay test results from the trial batch, notify the Engineer. Note that the Engineer may require that up to the entire subplot of any mixture failing the Hamburg Wheel test or Overlay test be removed and replaced at the Contractor's expense.

(16) Development of JMF3. Evaluate the test results from Lot 1, determine the optimum mixture proportions, and submit as JMF3 for use in Lot 2.

(17) JMF Adjustments. If necessary, adjust the JMF before beginning a new lot. The adjusted JMF must:

- be provided to the Engineer in writing before the start on a new lot;
- be numbered in sequence to the previous JMF;
- meet the master gradation limits shown in Table 6; and
- be within the operational tolerances of JMF2 listed in Table 8.

(18) Requesting Referee Testing. If needed, use referee testing in accordance with Section 347.4.I.1, "Referee Testing," to resolve testing differences with the Engineer.

Table 8
Operational Tolerances

Description	Test Method	Allowable Difference Between Trial Batch and JMF1 Target	Allowable Difference from Current JMF Target	Allowable Difference between Contractor and Engineer ¹
Individual % retained for #8 sieve and larger	Tex-200-F or Tex-236-F	Must be Within Master Grading Limits in Table 6	$\pm 3.0^{2,3}$	± 5.0
Individual % retained for sieves smaller than #8 and larger than #200			$\pm 3.0^{2,3}$	± 3.0
% passing the #200 sieve			$\pm 2.0^{2,3}$	± 1.6
Binder content, % ⁴	Tex-236-F	± 0.3	$\pm 0.3^3$	± 0.3
Laboratory-molded density, %	Tex-207-F	± 1.0	± 1.0	± 1.0
Laboratory-molded bulk specific gravity		N/A	N/A	± 0.020
VMA, % min	Tex-204-F	Note 4	Note 4	N/A
Theoretical maximum specific (Rice) gravity	Tex-227-F		N/A	± 0.020
Drain-down, %	Tex-235-F	Note 5	Note 5	N/A

1. Contractor may request referee testing only when values exceed these tolerances.

2. When within these tolerances, mixture production gradations may fall outside the master grading limits; however, the % passing the #200 will be considered out of tolerance when outside the master grading limits.

3. Only applies to mixture produced for Lot 1 and higher.

4. Binder content is not allowed to be outside the limits shown in Table 6. May be obtained from asphalt meter readouts.

5. Test and verify that Table 7 requirements are met.

- **Engineer's Responsibilities.**

- (1) **Gyratory Compactor.** For mixtures designed in accordance with Tex-204-F, Part I, the Engineer will use a Department TGC, calibrated in accordance with Tex-914-K, to mold samples for trial batch and production testing. The Engineer will make the Department TGC and the Department field laboratory available to the Contractor for molding verification samples, if requested by the Contractor.

For mixtures designed in accordance with Tex-204-F, Part IV, the Engineer will use a Department SGC, calibrated in accordance with Tex-241-F, to mold samples for laboratory mixture design verification. For molding trial batch and production specimens, the Engineer will use the Contractor-provided SGC at the field laboratory or provide and use a Department SGC at an alternate location. The Engineer will make the Contractor-provided SGC in the Department field laboratory available to the Contractor for molding verification samples.

- (2) **Conditional Approval of JMF1.** Within 2 working days of receiving the mixture design report (JMF1) and all required materials and Contractor-provided Hamburg Wheel test results and Department provided Overlay test results, the Engineer will review the Contractor's mix design report and verify conformance with all aggregates, asphalt, additives, and mixture specifications. The Engineer will grant the Contractor conditional approval of JMF1, if the information provided on the paper copy of JMF1 indicates that the Contractor's mixture design meets the specifications.

When the Contractor does not provide Hamburg Wheel test and Overlay test results with laboratory mixture design, 10 working days is allowed for conditional approval of JMF 1. The Engineer will base full approval of JMF1 on test results on mixture from the trial batch.

Unless waived, the Engineer will determine the Micro-Deval abrasion loss in accordance with Section 347.2.A.1.b, "Micro-Deval Abrasion." If the Engineer's test results are pending after 2 working days, conditional approval of JMF1 will still be granted within 2 working days of receiving JMF1. When the Engineer's test results become available, they will be used for specification compliance.

After conditionally approving JMF1, including either Contractor- or Department-supplied Hamburg Wheel test results, the Contractor is authorized to produce a trial batch.

- (3) **Hamburg Wheel and Overlay Testing of JMF1.** If the Contractor requests the option to have the Department perform the Hamburg Wheel test on the laboratory mixture, the Engineer will mold samples in accordance with Tex-242-F to verify compliance with the Hamburg Wheel test requirement in Table 7. The Engineer will perform the Overlay test and mold samples in accordance with Tex-248-F to verify compliance with the Overlay test requirements in Table 7.
- (4) **Ignition Oven Correction Factors.** The Engineer will use the split samples provided by the Contractor to determine the aggregate and asphalt correction factors for the ignition oven used for quality assurance testing during production in accordance with Tex-236-F.
- (5) **Testing the Trial Batch.** Within 1 full working day, the Engineer will sample and test the trial batch to ensure that the mixture meets the requirements listed in Table 8. If the Contractor requests the option to have the Department perform the Hamburg Wheel test on the trial batch mixture, the Engineer will mold samples in accordance with Tex-242-F to verify compliance with Hamburg Wheel test requirements in Table 7. The Engineer will mold samples for the Overlay test in accordance with Tex-248-F to verify compliance with the Overlay test requirement in Table 7.

The Engineer will have the option to perform the following tests on the trial batch:

- Tex-226-F, to verify that the indirect tensile strength meets the requirement shown in Table 7; and
- Tex-530-C, to retain and use for comparison purposes during production.

- (6) **Full Approval of JMF1.** The Engineer will grant full approval of JMF1 and authorize the Contractor to proceed with developing JMF2 if the Engineer's results for the trial batch meet the requirements in

Table 8. The Engineer will notify the Contractor that an additional trial batch is required if the trial batch does not meet these requirements.

- (7) **Approval of JMF2.** The Engineer will approve JMF2 within 1 working day if the gradation meets the master grading limits shown in Table 6 and is within the operational tolerances of JMF1 listed in Table 8. The asphalt content established for JMF2 is not required to be within any tolerance of the optimum asphalt content established for JMF1; however, mixture produced using JMF2 must meet the VMA requirements shown in Table 6. If the optimum asphalt content for JMF2 is more than 0.5% lower than the optimum asphalt content for JMF1, the Engineer may perform or require the Contractor to perform Tex-226-F on Lot 1 production to confirm the indirect tensile strength does not exceed 200 psi.
- (8) **Approval of Lot 1 Production.** The Engineer will authorize the Contractor to proceed with Lot 1 production (using JMF2) as soon as a passing result is achieved from the Department's or an approved laboratory's Hamburg Wheel test and from the Department's Overlay test. As an option, the Contractor may, at their own risk, proceed with Lot 1 production without results from the Hamburg Wheel test and Overlay test on the trial batch.

If the Department's or approved laboratory's sample from the trial batch fails the Hamburg Wheel test or Overlay test, the Engineer will suspend production until further Hamburg Wheel tests or Overlay tests meet the specified values. The Engineer may require up to the entire subplot of any mixture failing the Hamburg Wheel test or Overlay test to be removed and replaced at the Contractor's expense.

- (9) **Approval of JMF3 and Subsequent JMF Changes.** JMF3 and subsequent JMF changes are approved if they meet the master grading limits shown in Table 6, mixture requirements shown in Table 7, and are within the operational tolerances of JMF2 shown in Table 8.

D. Production Operations. Perform a new trial batch when the plant or plant location is changed. Take corrective action and receive approval to proceed after any production suspension for noncompliance to the specification.

- 1. Storage and Heating of Materials.** Do not heat the asphalt binder above the temperatures specified in Item 300, "Asphalts, Oils, and Emulsions," or outside the manufacturer's recommended values. On a daily basis, provide the Engineer with the records of asphalt binder and hot-mix asphalt discharge temperatures (in legible discernible increments) in accordance with Item 320, "Equipment for Hot-Mix Asphalt Materials", unless otherwise directed. Do not store mixture for a period long enough to affect the quality of the mixture, nor in any case longer than 12 hr unless otherwise approved.

- 2. Mixing and Discharge of Materials.** Notify the Engineer of the target discharge temperature and produce the mixture within 25°F of the target. Monitor the temperature of the material in the truck before shipping to ensure that it does not exceed 350°F (or 275°F for WMA) and is not lower than 215°F. The Department will not pay for or allow placement of any mixture produced at more than 350°F.

When WMA is required, produce the WMA within the target temperature discharge range of 215°F and 275°F. Take corrective action any time the discharge temperature of the WMA exceeds the target discharge range. The Engineer may suspend production operations if the Contractor's corrective action is not successful at controlling the production temperature within the target discharge range. Note that when WMA is produced, it may be necessary to adjust burners to ensure complete combustion such that no burner fuel residue remains in the mixture.

Control the mixing time and temperature so that substantially all moisture is removed from the mixture before discharging from the plant. If requested, determine the moisture content by oven-drying in accordance with Tex-212-F, Part II, and verify that the mixture contains no more than 0.2% of moisture by weight. Obtain the sample immediately after discharging the mixture into the truck, and perform the test promptly.

- E. Hauling Operations.** Before use, clean all truck beds to ensure that mixture is not contaminated. When a release agent is necessary, use a release agent on the Department's Material Producer List to coat the inside bed of the truck.

Use only equipment for hauling as defined in Section 347.G.3.c, "Hauling Equipment." Other hauling equipment may be used when allowed by the Engineer.

- F. Placement Operations.** Collect haul tickets from each load of mixture delivered to the project and provide the Department's copy to the Engineer approximately every hour, or as directed by the Engineer. When the Pave-IR system is not used for specification compliance, use a non-contact infrared thermometer to measure and record the internal temperature of the mixture as discharged from the truck or material transfer device prior to or as the mix enters the paver and an approximate station number or GPS coordinates on each ticket. Calculate the daily yield and cumulative yield for the specified lift and provide to the Engineer. The Engineer may suspend production if the Contractor fails to produce and provide haul tickets and yield calculations by the end of paving operations for each day.

Prepare the surface by removing raised pavement markers and objectionable material such as moisture, dirt, sand, leaves, and other loose impediments from the surface before placing mixture. Remove vegetation from pavement edges. Place the mixture to meet the typical section requirements and produce a smooth, finished surface with a uniform appearance and texture. Place mixture so that longitudinal joints on the surface course coincide with lane lines, or as directed. Ensure that all finished surfaces will drain properly. Place the mixture at the rate or thickness shown on the plans. The Engineer will use the guidelines in Table 9 to determine the compacted lift thickness. The thickness determined is based on the rate of 110-115 lb/sq. yd. for each inch of pavement unless otherwise shown on the plans.

Table 9
Compacted Lift Thickness

Thin Mixture Type	Compacted Lift Thickness¹	
	Minimum (in.)	Maximum (in.)
TOM	0.75	1.25
UT	0.5	0.75

1. Compacted target lift thickness will be specified on the plans.

1. **Weather Conditions.** Place mixture when the air temperature is equal to or higher than 70°F unless otherwise approved. The Engineer may allow mixture placement to begin prior to reaching the required temperature, if conditions are such that the required temperature is reached within 1 hour of beginning placement operations. Place mixtures only when weather conditions and moisture conditions of the roadway surface are suitable in the opinion of the Engineer. The Engineer may restrict the Contractor from paving when the air temperature is 70°F and falling. The Contractor may pave when the air temperature is below 70°F, but greater than 60°F when using a Department approved WMA additive to facilitate compaction and with a target discharge temperature higher than 300°F.

2. **Tack Coat.** Clean the surface before placing the tack coat. Unless otherwise approved, apply tack coat uniformly at the rate directed by the Engineer. The Engineer will set the rate between 0.04 and 0.1 gal. of residual asphalt per square yard of surface area, unless otherwise approved or shown on the plans. Apply a uniform tack coat to all contact surfaces of curbs, structures, and all joints. Allow adequate time for emulsion to break completely prior to placing any material. Prevent splattering of tack coat when placed adjacent to curb, gutter, and structures. Roll the tack coat with a pneumatic-tire roller to remove streaks and other irregularities patterns when directed. The Engineer may suspend paving operations until there is adequate coverage.

3. **Lay-Down Operations.**
 - **Thermal Profile.** Use a handheld thermal camera or the Pave-IR system (paver mounted infrared bar) to obtain continuous thermal profiles in accordance with Tex-244-F.
 - (1) **Thermal Segregation.**
 - (a) **Moderate Thermal Segregation.** Any areas that have a temperature differential greater than 25°F but not exceeding 50°F are deemed as having moderate thermal segregation.
 - (b) **Severe Thermal Segregation.** Any areas that have a temperature differential greater than 50°F are deemed as having severe thermal segregation.
 - (2) **Pave-IR System.** When the Pave-IR system is used, review the output results and provide the automated report described in Tex-244-F to the Engineer on a daily basis unless otherwise directed.

Modify the paving process as necessary to eliminate any recurring (moderate or severe) thermal segregation identified by the Pave-IR system. The Engineer may suspend paving operations if the Contractor cannot successfully modify the paving process to eliminate recurring severe thermal segregation. Upon completion of the project or as requested by the Engineer, provide the Engineer with electronic copies of all daily data files that can be used with the Pave-IR system software to generate temperature profile plots.

(3) Thermal Camera. When a handheld thermal camera is used, take immediate corrective action to eliminate moderate thermal segregation. Evaluate areas with moderate thermal segregation by performing water flow testing in accordance to Tex-246-F and verify the water flow is greater than 60 seconds. Within 1 working day of the completion of each lot, provide the Engineer with the thermal profile of every subplot within the lot. Report the results of each thermal profile in accordance with Section 347.4.B, "Reporting and Responsibilities." The Engineer will use a handheld thermal camera to obtain a thermal profile at least once per project. Suspend operations and take immediate corrective action to eliminate severe thermal segregation unless otherwise directed. Resume operations when the Engineer determines that subsequent production will meet the requirements of this Section. Evaluate areas with severe thermal segregation by performing water flow testing in accordance to Tex-246-F and verify the water flow is greater than 60 seconds. Remove and replace the material in any areas that have both severe thermal segregation and a failing result for water flow test, unless otherwise directed.

b. Windrow Operations. When hot mix is placed in windrows, operate windrow pickup equipment so that substantially all the mixture deposited on the roadbed is picked up and loaded into the paver.

c. Hauling Equipment. The Contractor may elect to use belly dumps, live bottom, or end dump trucks to haul and transfer mixture; however, with exception of paving miscellaneous areas, end dump trucks are only allowed when used in conjunction with a MTD with remixing capability unless otherwise allowed by the Engineer.

d. Screed Heaters. If the paver stops for more than 5 minutes, turn off screed heaters to prevent overheating of the mat. If the screed heater remains on for more than 5 minutes while the paver is stopped, the Engineer may evaluate the suspect area in accordance with Section 347.4.I.3.a(1), "Recovered Asphalt Dynamic Shear Rheometer (DSR)."

G. Compaction. Roll the freshly placed mixture with a steel-wheeled roller without excessive breakage of the aggregate to provide a smooth surface and uniform texture. Operate the roller in static mode for UT mixture only. Do not use pneumatic-tire rollers. Use the control strip method given in Tex-207-F, Part IV, to establish the rolling pattern.

Thoroughly moisten the roller drums with a soap and water solution to prevent adhesion. Use only water or an approved release agent on rollers, tamps, and other compaction equipment unless otherwise directed.

Use tamps to thoroughly compact the edges of the pavement along curbs, headers, and similar structures and in locations that will not allow thorough compaction with rollers. The Engineer may require rolling with a trench roller on widened areas, in trenches, and in other limited areas.

Use Tex-246-F to measure water flow to verify the mixture is adequately compacted. Measure the water flow once per subplot at locations directed by the Engineer. Take additional water flow measurements when both of the following conditions occur:

- the temperature of the mixture before compaction falls below 275°F; and
- warm mix additives or processes are not used.

The water flow rate should be greater than 60 seconds. If the water flow rate is less than 60 seconds adjust the mix design or construction methods when directed by the Engineer.

Allow the compacted pavement to cool to 160°F or lower before opening to traffic, unless otherwise directed. When directed, sprinkle the finished mat with water or limewater to expedite opening the roadway to traffic.

H. Acceptance Plan. Sample and test the hot mix asphalt on a lot and subplot basis. If production test results fail to meet the operational tolerance requirements in Table 8 for any material property for four consecutive sublots, suspend production until test results or other information indicates to the satisfaction of the Engineer that the next material produced or placed will meet specification requirements.

1. Referee Testing. The Construction Division is the referee laboratory. The Contractor may request referee testing if the differences between Contractor and Engineer test results exceed the maximum allowable difference shown in Table 8 and the differences cannot be resolved. The Contractor may also request referee testing if the Engineer's test results require suspension of production and the Contractor's test results are within specification limits. Make the request within 5 working days after receiving test results from the Engineer. Referee tests will be performed only on the subplot in question and only for the particular test in question. Allow 10 working days from the time the samples are received at the referee laboratory for test results to be reported. The Department may require the Contractor to reimburse the Department for referee tests if more than three referee tests per project are required and the Engineer's test results are closer than the Contractor's test results to the referee test results.

The Construction Division will determine the laboratory-molded density based on the molded specific gravity and the maximum theoretical specific gravity of the referee sample.

2. Production Acceptance.

- **Production Lot.** A production lot consists of four equal sublots. The default quantity for Lot 1 is 500 tons; however, when requested by the Contractor, the Engineer may increase the quantity for Lot 1 to no more than 2,000 tons. The Engineer will select subsequent lot sizes based on the anticipated daily production such that approximately three to four sublots are produced each day. The lot size will be between 500 tons and 2,000 tons. The Engineer may change the lot size before the Contractor begins any lot.
- (1) **Incomplete Production Lots.** If a lot is begun but cannot be completed, such as on the last day of production or in other circumstances deemed appropriate, the Engineer may close the lot. Close all lots within 5 working days unless otherwise allowed by the Engineer.
- **Production Sampling.**
 - (1) **Mixture Sampling.**

Obtain hot mix samples from trucks at the plant in accordance with Tex-222-F. The sampler will split each sample into three equal portions in accordance with Tex-200-F and label these portions as “Contractor,” “Engineer,” and “Referee.” The Engineer will perform or witness the sampling and take immediate possession of the samples labeled “Engineer” and “Referee.” The Engineer will maintain the custody of the samples labeled “Engineer” and “Referee” until the Department’s testing is completed.

 - (a) **Random Sample.** At the beginning of the project, the Engineer will select random numbers for all production sublots. Determine sample locations in accordance with Tex-225-F. For each subplot, take one sample at the location randomly selected. The Engineer will perform or witness the sampling of production sublots.
 - (b) **Blind Sample.** For one subplot per lot, the Engineer will obtain and test a “blind” sample in lieu of the random sample collected by the Contractor. The Contractor may test either the “blind” or the random sample; however, referee testing (if applicable) will be based on a comparison of results from the “blind” sample. The location of the Engineer’s “blind” sample will not be disclosed to the Contractor. The Engineer’s “blind” sample may be randomly selected in accordance with Tex-225-F for any subplot or selected at the discretion of the Engineer. The Engineer will use the Contractor’s split sample for sublots not sampled by the Engineer.
 - (2) **Asphalt Binder Sampling.** Obtain a 1 qt. sample of the asphalt binder for each lot of mixture produced. Obtain the sample at approximately the same time the mixture random is obtained. Sample from a port located immediately upstream from the mixing drum or pug mill in accordance with Tex-500-C, Part II. Label the can with

the corresponding lot and subplot numbers, and deliver the sample to the Engineer. The Engineer may also obtain independent samples. If obtaining an independent asphalt binder sample, the Engineer will split a sample of the asphalt binder with the Contractor. The Engineer will test at least one asphalt binder sample per project to verify compliance with Item 300, "Asphalts, Oils, and Emulsions."

- **Production Testing.** The Contractor and Engineer must perform production tests in accordance with Table 10. The Contractor has the option to verify the Engineer's test results on split samples provided by the Engineer. Determine compliance with operational tolerances listed in Table 8 for all sublots.

If the Engineer's laboratory-molded density on any subplot is less than 95.0% or greater than 98.0% when using the SGC or less than 96.5% or greater than 98.5% when using the TGC, take immediate corrective action to bring the mixture within these tolerances. The Engineer may suspend operations if the Contractor's corrective actions do not produce acceptable results. The Engineer will allow production to resume when the proposed corrective action is likely to yield acceptable results.

If the aggregate mineralogy is such that Tex-236-F does not yield reliable results, the Engineer may allow alternate methods for determining the asphalt content and aggregate gradation. Provide evidence that results from Tex-236-F are not reliable before requesting permission to use an alternate method unless otherwise directed. If an alternate test method is allowed, use the applicable test procedure as directed.

Table 10
Production and Placement Testing Frequency

Description	Test Method	Minimum Contractor Testing Frequency	Minimum Engineer Testing Frequency
Individual % retained for #8 sieve and larger	Tex-200-F or Tex-236-F	1 per subplot	1 per 12 sublots
Individual % retained for sieves smaller than #8 and larger than #200			
% passing the #200 sieve			
Laboratory-molded density	Tex-207-F	N/A	1 per subplot
Laboratory-molded bulk specific gravity			
VMA	Tex-204-F		
Moisture content	Tex-212-F, Part II	When directed	
Theoretical maximum specific (Rice) gravity	Tex-227-F	N/A	1 per subplot
Asphalt binder content	Tex-236-F	1 per subplot	1 per lot
Overlay test ¹	Tex-248-F	N/A	1 per project
Cantabro loss ¹	Tex-245-F	N/A	1 per project
Hamburg Wheel test	Tex-242-F	N/A	1 per project
Thermal profile	Tex-244-F	1 per subplot	
Asphalt binder sampling and testing ¹	Tex-500-C	1 per subplot (sample only)	
Boil test ²	Tex-530-C	1 per subplot	
Water Flow	Tex-246-F		

Description	Test Method	Minimum Contractor Testing Frequency	Minimum Engineer Testing Frequency
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1. Testing performed by the Construction Division or as directed by the Engineer. Cantabro loss is for informational purposes only.

2. The Engineer may reduce or waive the sampling and testing requirements based on a satisfactory test history.

- **Operational Tolerances.** Control the production process within the operational tolerances listed in Table 8. When production is suspended, the Engineer will allow production to resume when test results or other information indicates that the next mixture produced will be within the operational tolerances.
- (1) **Gradation.** Suspend production and take corrective action if any aggregate is retained on the maximum sieve size shown in Table 6. A subplot is defined as out of tolerance if either the Engineer's or the Contractor's test results are out of operational tolerance. Unless otherwise directed, suspend production when test results for gradation exceed the operational tolerances for three consecutive sublots on the same sieve or four consecutive sublots on any sieve. The consecutive sublots may be from more than one lot.
 - (2) **Asphalt Content.** A subplot is defined as out of operational tolerance if either the Engineer's or the Contractor's test results exceed the values listed in Table 6. Suspend production when two or more sublots within a lot are out of operational tolerance or below the minimum asphalt content specified in Table 6 unless otherwise directed. Suspend production and shipment of mixture if the asphalt content deviates from the current JMF by more than 0.5% for any subplot.
 - (3) **Void in Mineral Aggregate (VMA).** The Engineer will determine the VMA for every subplot. For sublots when the Engineer does not determine asphalt content, the Engineer will use the asphalt content results from quality control testing performed by the Contractor to determine VMA.

Take immediate corrective action if the VMA value for any subplot is less than the minimum VMA requirement for production listed in Table 6. Suspend production and shipment of the mixture if the Engineer's VMA results on two consecutive sublots are below the minimum VMA requirement for production listed in Table 6.

Suspend production and shipment of the mixture if the Engineer's VMA result is more than 0.5% below the minimum VMA requirement for production listed in Table 6. In addition to suspending production, the Engineer may require removal and replacement or may allow the subplot to be left in place without payment.

- (4) **Hamburg Wheel and Overlay Test.** The Engineer may perform a Hamburg Wheel or Overlay test at any time during production, including when the boil test indicates a change in quality from the materials submitted for JMF1. When the production fail to meet the Hamburg Wheel or Overlay test criteria in Table 7, suspend production until further Hamburg Wheel or Overlay tests meet the specified values. The Engineer may require up to the entire subplot of any mixture failing the Hamburg Wheel or Overlay test to be removed and replaced at the Contractor's expense.

If the Department's Hamburg Wheel or Overlay test or Department-approved laboratory's Hamburg Wheel test results in a "remove and replace" condition, the Contractor may request that the Department confirm the results by retesting the failing material. The Construction Division will perform the Hamburg Wheel and Overlay tests and determine the final disposition of the material in question based on the Department's test results.

- **Individual Loads of Mix.** The Engineer can reject individual truckloads of mix. When a load of mix is rejected for reasons other than temperature, contamination, or excessive uncoated particles, the Contractor may request that the rejected load be tested. Make this request within 4 hr. of rejection. The Engineer will sample and test the mixture. If test results are within the operational tolerances shown in Table 8, payment will be made for the load. If test results are not within operational tolerances, no payment will be made for the load, and the Engineer may require removal.

3. Placement Acceptance.

- **Placement Lot.** A placement lot consists of four placement sublots. A placement subplot consists of the area placed during a production subplot.

- (1) **Recovered Asphalt Dynamic Shear Rheometer (DSR).** The Engineer may take production samples or cores from suspect areas of the project to determine recovered asphalt properties. Asphalt binders with an aging ratio greater than 3.5 do not meet the requirements for recovered asphalt properties and may be deemed defective when tested and evaluated by the Construction Division. The aging ratio is the DSR value of the extracted binder divided by the DSR value of the original unaged binder. Obtain DSR values in accordance with AASHTO T 315 at the specified high temperature performance grade of the asphalt. The Engineer may require removal and replacement of the defective material at the Contractor's expense. The asphalt binder will be recovered for testing from production samples or cores in accordance with Tex-211-F.

- (2) **Irregularities.** Identify and correct irregularities including but not limited to segregation, rutting, raveling, flushing, fat spots, mat slippage, irregular color, irregular texture, roller marks, tears, gouges, streaks, uncoated aggregate particles, or broken aggregate particles.

The Engineer may also identify irregularities, and in such cases, the Engineer will promptly notify the Contractor. If the Engineer determines that the irregularity will adversely affect pavement performance, the Engineer may require the Contractor to remove and replace (at the Contractor's expense) areas of the pavement that contain irregularities and areas where the mixture does not bond to the existing pavement. If irregularities are detected, the Engineer may require the Contractor to immediately suspend operations or may allow the Contractor to continue operations for no more than 1 day while the Contractor is taking appropriate corrective action.

4. **Exempt Production.** When the anticipated daily production is less than 100 tons, all quality control and quality assurance sampling and testing are waived. The Engineer may deem the mixture as exempt production for the following conditions:

- anticipated daily production is more than 100 tons but less than 250 tons;
- total production for the project is less than 2,500 tons;
- when mutually agreed between the Engineer and the Contractor; or
- when shown on the plans.

For exempt production, the Contractor is relieved of all production and placement sampling and testing requirements. All other specification requirements apply, and the Engineer will perform acceptance tests for production and placement listed in Table 10.

For exempt production:

- produce, haul, place, and compact the mixture as directed by the Engineer; and
- control mixture production to yield a laboratory-molded density that is within $\pm 1.0\%$ of the target density as tested by the Engineer.

5. **Ride Quality.** Unless otherwise shown on the plans, measure ride quality in accordance with Item 585, "Ride Quality for Pavement Surfaces."

5. **Measurement.** TSM will be measured by the ton of composite mixture. The composite mixture is defined as the asphalt, aggregate, and additives. The weights of asphalt and aggregate will be calculated based on the measured weight of TSM and the target percentage of asphalt and aggregate. Measure the weight on scales in accordance with Item 520, "Weighing and Measuring Equipment."

- A. **Asphalt.** The asphalt weight in tons will be determined from the total weight of TSM. Measured asphalt percentage will be obtained using Tex-236-F or asphalt flow meter readings, as determined by the Engineer. Provide the Engineer with a daily summary of the asphalt mass flow meter readings when used for measuring asphalt percentage unless otherwise directed.

1. **Target Percentage.** The JMF target asphalt percentage will be used to calculate the weight of asphalt binder unless the measured asphalt binder percentage is more than 0.3 percentage points below the JMF target asphalt percentage or less than the minimum percentage specified in Table 6. Volumetric meter readings will be adjusted to 140°F and converted to weight.
 2. **Measured Percentage.** The average measured asphalt percentage from each subplot will be used for payment for that lot's production when the measured percentage for any subplot is more than 0.3 percentage points below the JMF target asphalt percentage or less than the minimum percentage specified in Table 6.
- B. Aggregate.** The aggregate weight in tons will be determined from the total weight of TSM less the weight of the asphalt.
6. **Payment.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Thin Surface Mixtures (Asphalt)" of the binder specified and for "Thin Surface Mixtures (Aggregate)" of the grade and surface aggregate classification specified. These prices are full compensation for surface preparation, materials including tack coat, placement, equipment, labor, tools, and incidentals.

Trial batches will not be paid for unless they are included in pavement work approved by the Department.

Pay adjustment for ride quality will be determined in accordance with Item 585, "Ride Quality for Pavement Surfaces."